# POPULAR SCIENCE

MONTHLY

MECHANICS AND HANDICRAFT



**Electric Car for Boys–PAGE 136**

**25¢ September**

AUG 23 P.M.

## How They've Made Hot Rods Safe PAGE 142

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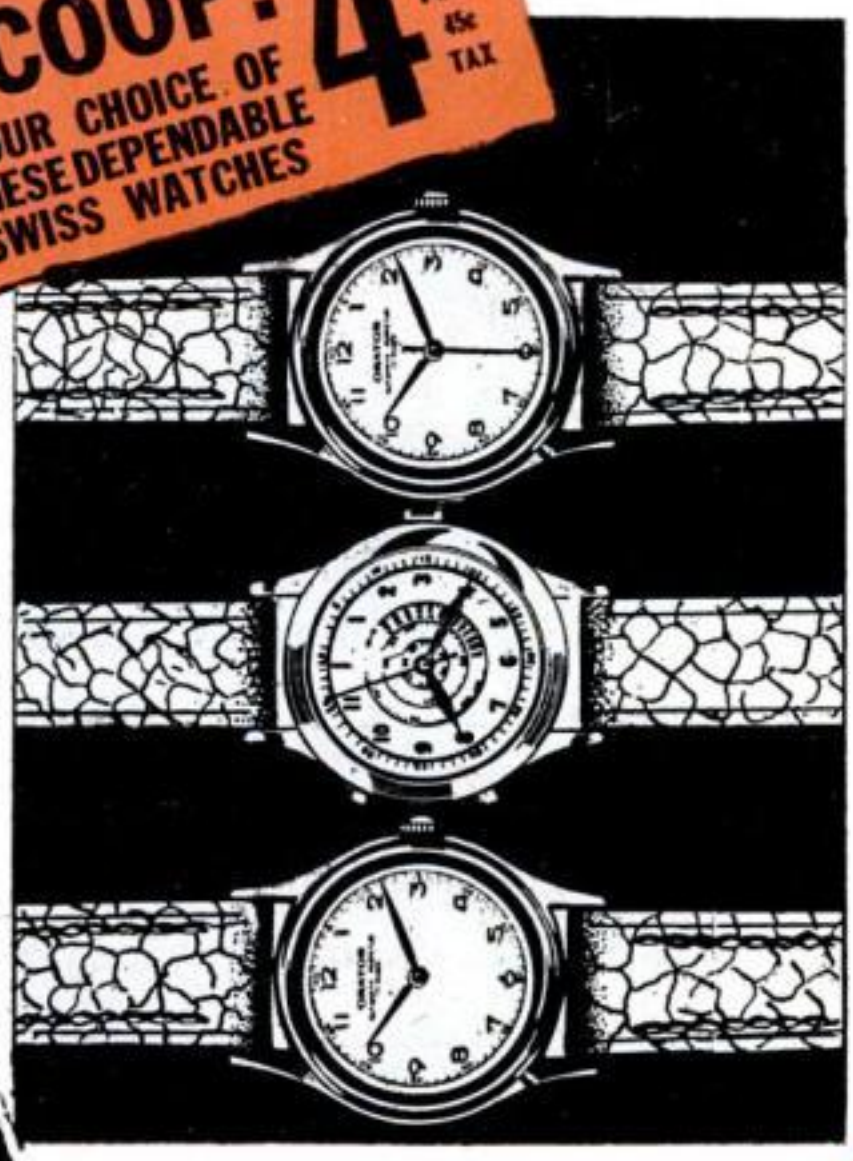
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***Mechanics and Handicraft***

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## *This Month's Big Features:*



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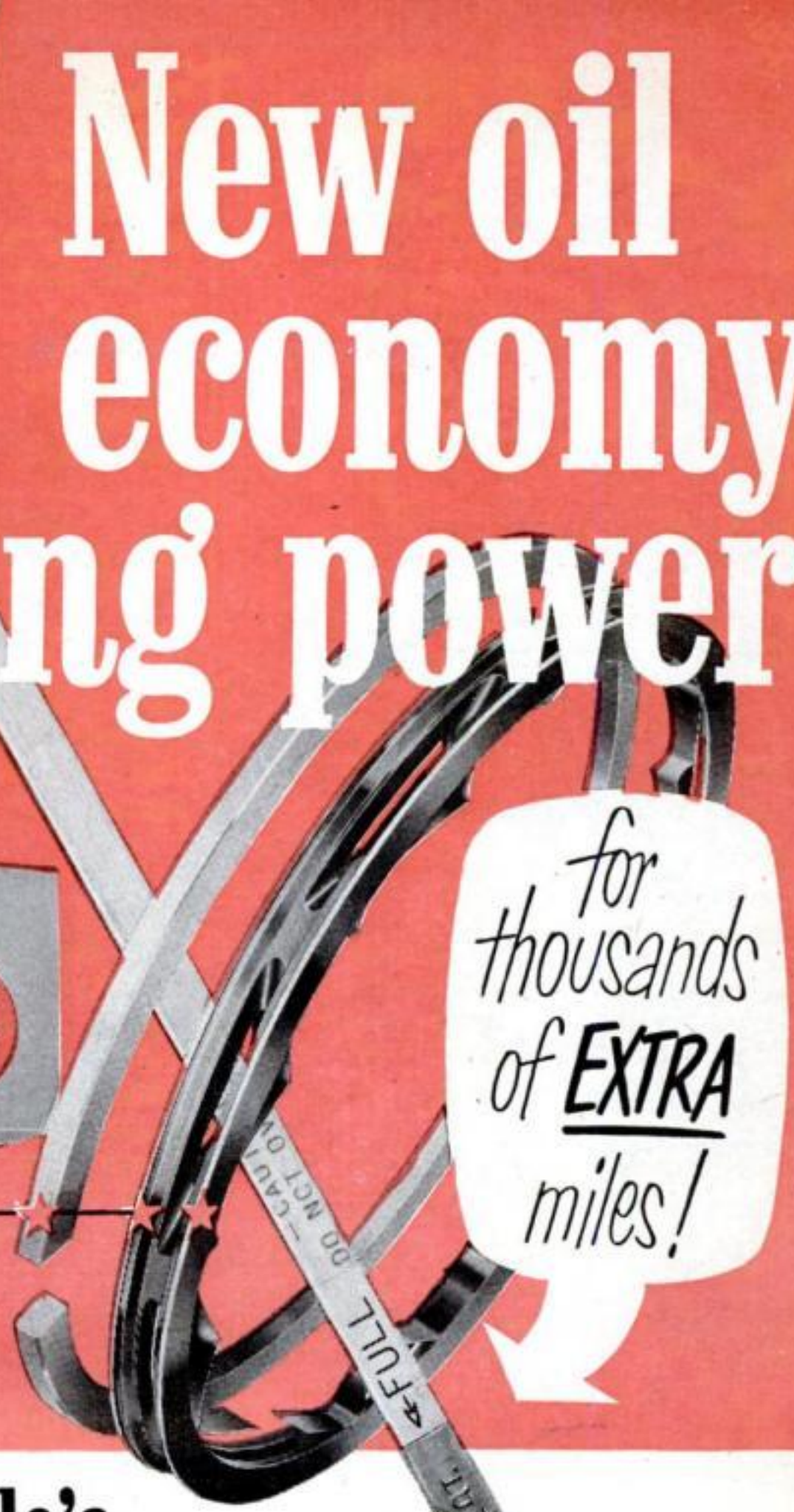
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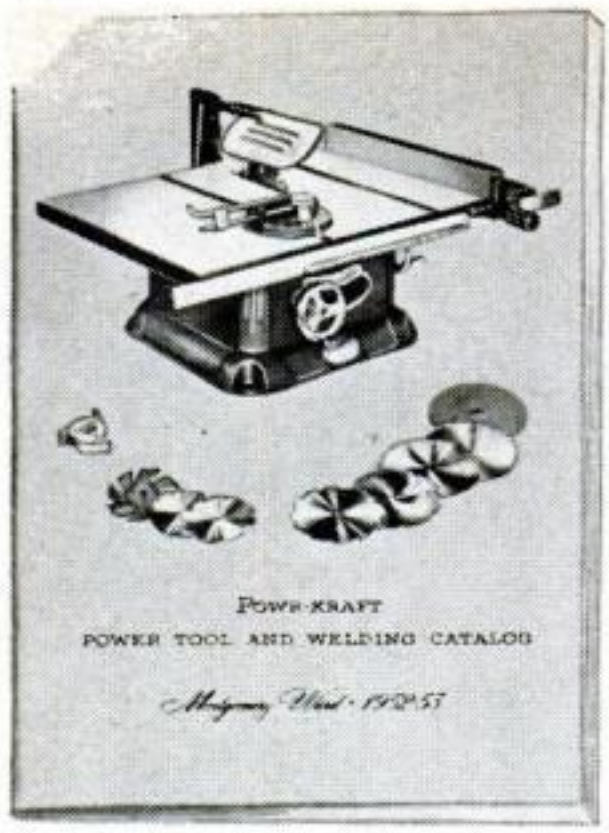
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*NEXT MONTH . . .*

## Cutting Winter Fuel Bills



Weather stripping is one answer. All those cracks around windows and doors add up to one big heat leak unless you plug them. What weather stripping to use and how to apply it will be detailed next month.



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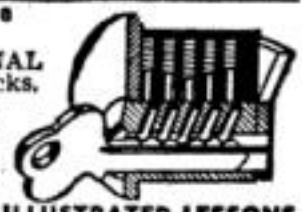
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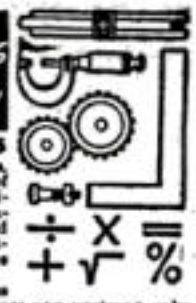
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# Letters

### It Looks Simple, but Isn't

In your article on the '52 Olds (June, p. 89), Wilbur Shaw mentions the past experiments made with polarizing lenses to cut headlight glare. Why was this scheme never adopted?

O. F. LARSEN, Milwaukee.

*The use of polarizing glass has been studied for years. The auto industry has held off, however, on the grounds that:*

1. *Lamps six times as bright as present ones would be needed, requiring a generator twice as big, because of the large amount of light absorbed by the glass.*

2. *Special lamps would have to be added for city driving because pedestrians would not have viewers to shield them from the increased brightness of the lights.*

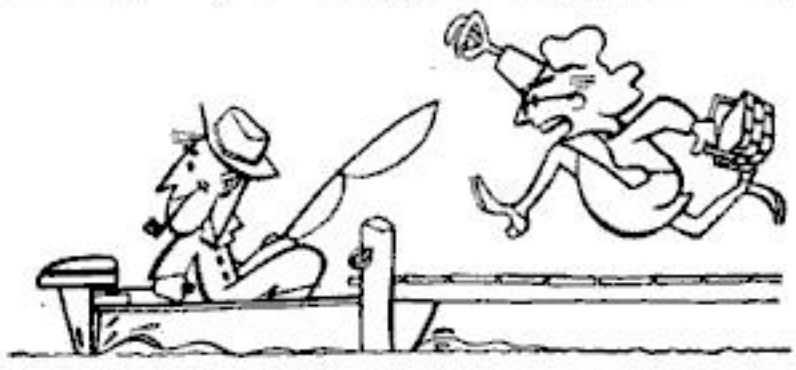
3. *The warning glow of an oncoming car around a corner or over a hilltop would be absent, adding to driving hazards.*

4. *All cars would have to be equipped simultaneously, or those not equipped would be blinded by the extra-bright headlights of those that were.*

### Outboards Challenge Inboards

Robert J. Whittier's fine article "Now You Too Can Own a Yacht" [July '52, p. 96] makes a strong case for "egg-beater" yachtsmen, but he left out one major selling point concerning outboard cruising.

Perhaps the greatest impetus behind the growing popularity of outboard boating is the comparatively recent development of gearshift motors. These power plants are erasing most boatmen's prime objection to outboard motors—namely, the lack of maneuverability—by enabling the skipper to warm



up his engine in neutral, back out of slips, and brake forward speed through reverse shifting.

LORNE S. WADDELL, Hagerstown, Md.

### Long-Range TV

I have just read your article "Kansas TV Fan Gets Both Coasts" in the July issue [p. 171].

Here in Orlando, Fla., we get some pretty distant stations, too. We have a DuMont Westminster set with a 21-inch screen, two boosters, and an aerial that is 40 feet up. At various times, we have gotten Baltimore, Boston, Chicago, Cleveland, Columbus, Dallas, Detroit, Kalamazoo, Milwaukee, New York, Oklahoma City, Omaha, and Pittsburgh.

One interesting point is that the person from Kansas says that the best time for freak reception is "10 p.m. to midnight." Most of the cities mentioned above were received during the late morning and early afternoon.

JOEL G. KAPLAN, Orlando, Fla.

### Help Wanted

I need some help—but fast. We have been arguing recently over the Tucker car, and a fellow bet me $40 to my $1 that no Tucker



ever ran and that, if it did, it did not have a Tucker engine but used a Duesenberg.

I maintain that a Tucker did run and that it had its own engine. I am about to get engaged and can use the money.

PH, 3 STEWART D. RUSBY, USN
% FPO, NYC.

*You can collect that $40. A Tucker car was driven in 1948 before an audience of newspaper men in Detroit. It was powered by its own air-cooled, six-cylinder engine. This engine was developed by Air Cooled Motors of Syracuse, N.Y. Preston Tucker bought the engine factory from Republic Aviation. Legally, therefore, it was a Tucker engine.*

### But Who'll Dim His Lights?

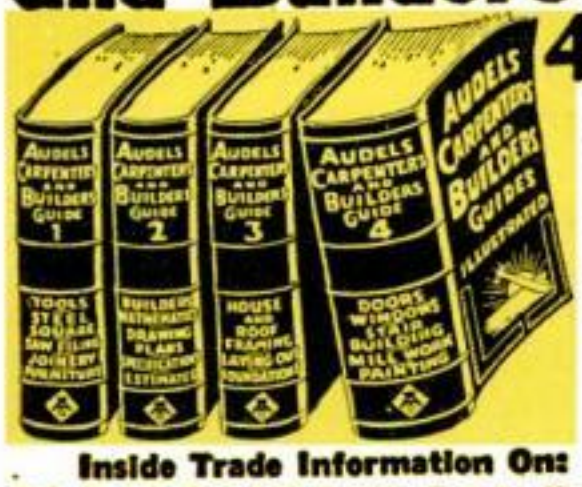
I was very pleased with the amusing little story on page 190 of the July issue showing the Rube Goldbergish electronic match lighter. I take it as a sort of satire on the complexities of modern living.

The first thing it brought to mind was



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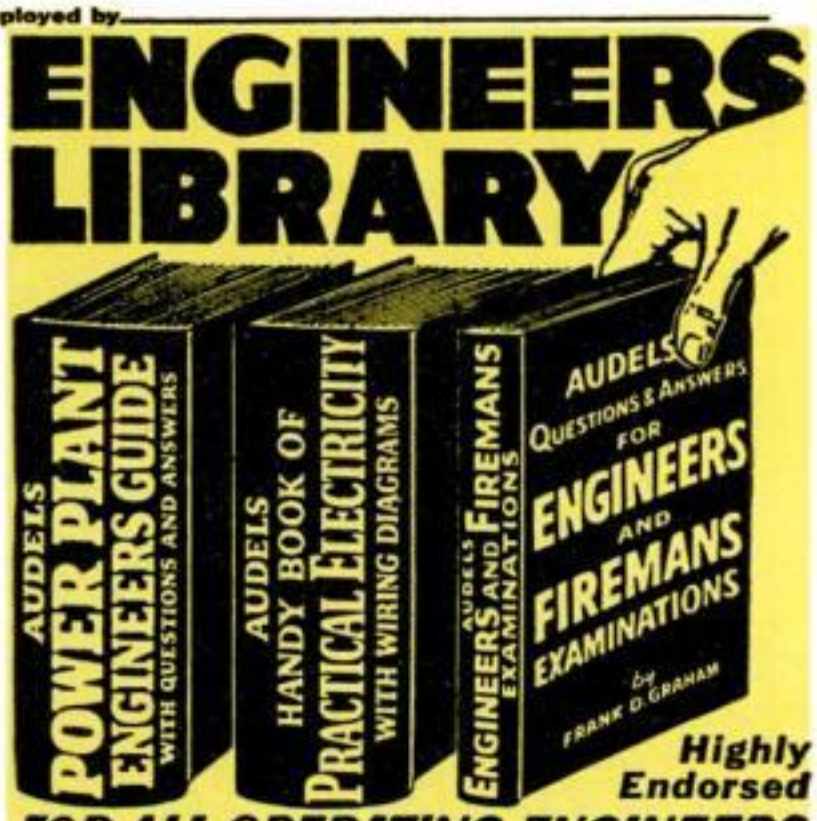
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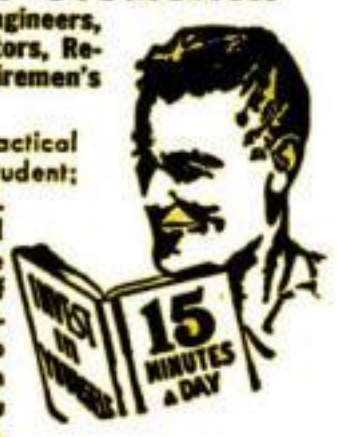

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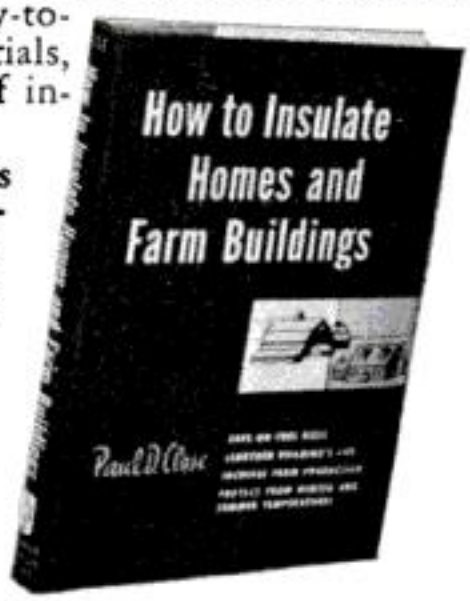
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General Motors' Autronic-Eye, which Wilbur Shaw discussed in the June issue [p. 89]. Now this gadget, in its own way of simplifying driving, gives us not one but two buttons to find and distinguish with our otherwise vestigial left foot. How far can simplification go?

It seems to me that paying over $50 for a gadget that dims *my* lights is a waste of money. What *would* be worth $50 is something that would dim the *other* guy's lights.

PFC. GEORGE R. KORNFELD
Sacramento Signal Depot, Calif.

### Gears on Grades

We were touring through New Hampshire in our new car, and my wife decided she wanted to take the toll road up Mt. Washington. But when the people at the



tollhouse saw we had an automatic transmission, they refused to let us climb.

What kind of jokers are these Detroit engineers? They make you pay extra for an automatic drive, and never whisper a word about how it isn't as good as a gearbox at getting you up steep grades.

JIM MCNABB, Boston.

*The difficulty is going down, not up. The Mt. Washington Summit Road Co. says that automatic-shift cars don't have trouble climbing the mountain but that some—makes unspecified—do not have enough compression drag for the descent. The toll road has a steady grade averaging 12 percent over its eight-mile length. Without plenty of engine drag to help, brakes on a descending car are likely to overheat and burn out.*

*The restriction isn't new; about 40 years ago Model T Fords were also barred.*

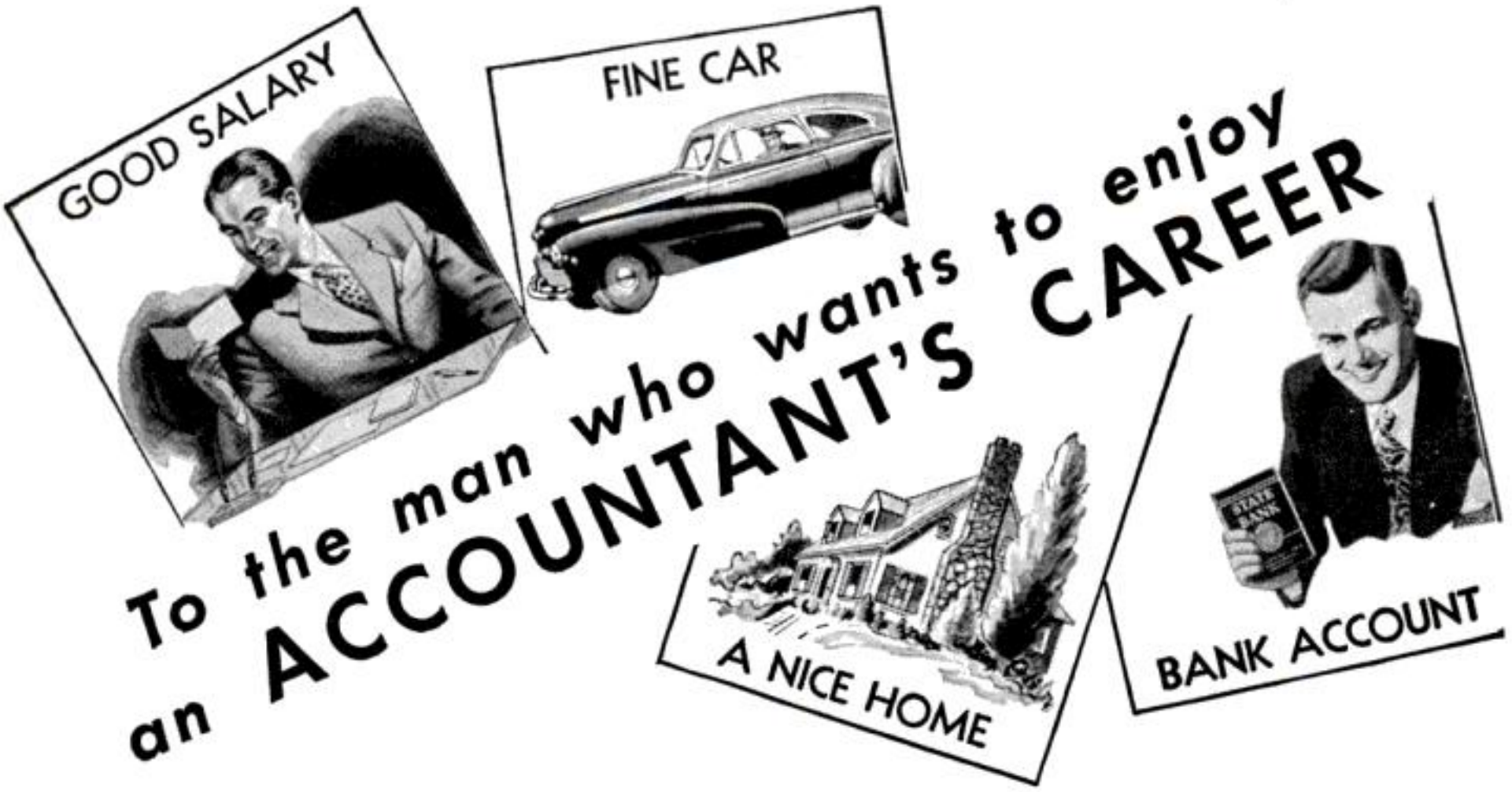
### Tip on Undercoating

Readers who undercoat their own cars should be very careful to keep the material off the propeller shaft, also the fan if they coat the underside of the hood. Undercoating on either the shaft or fan may cause noticeable vibration.

PETER HARRIS, Chicago



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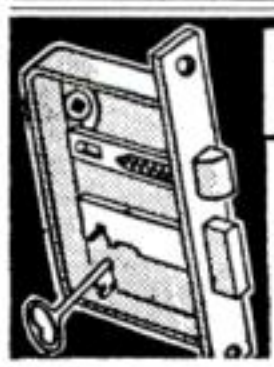


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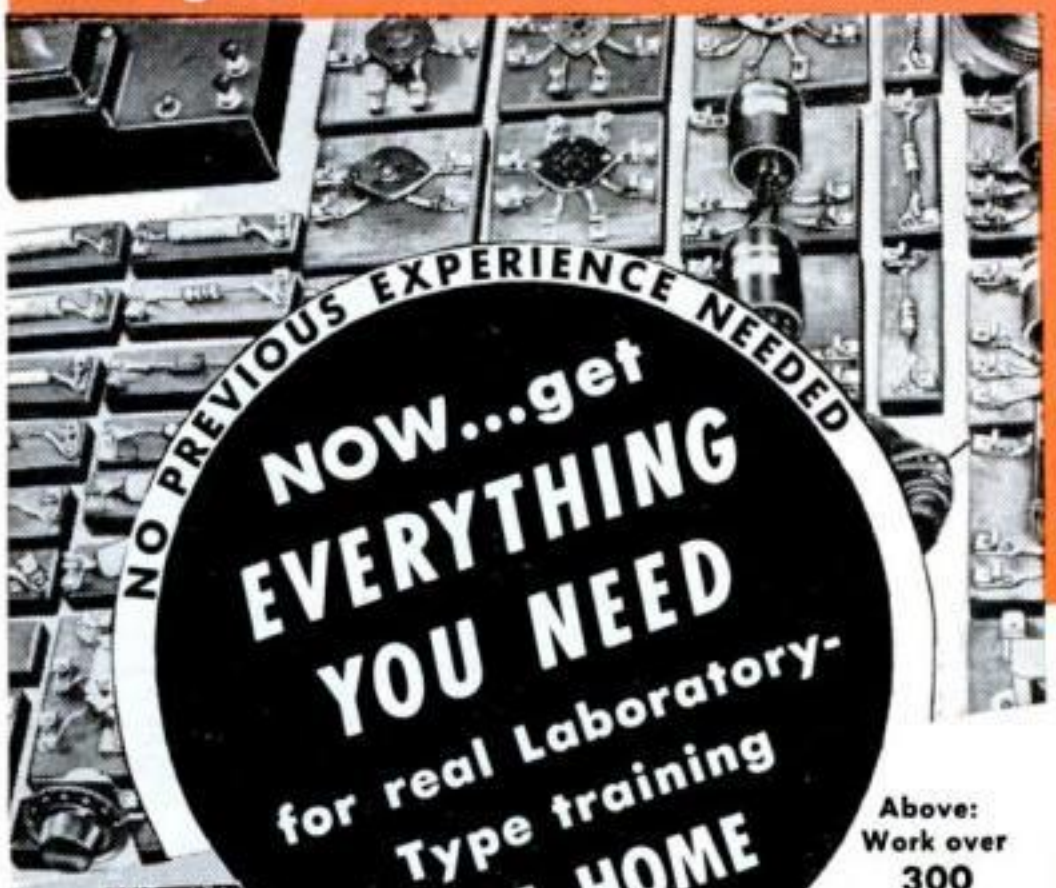
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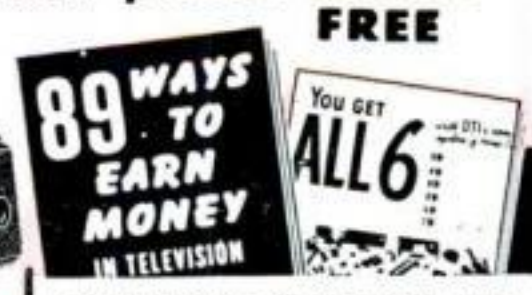
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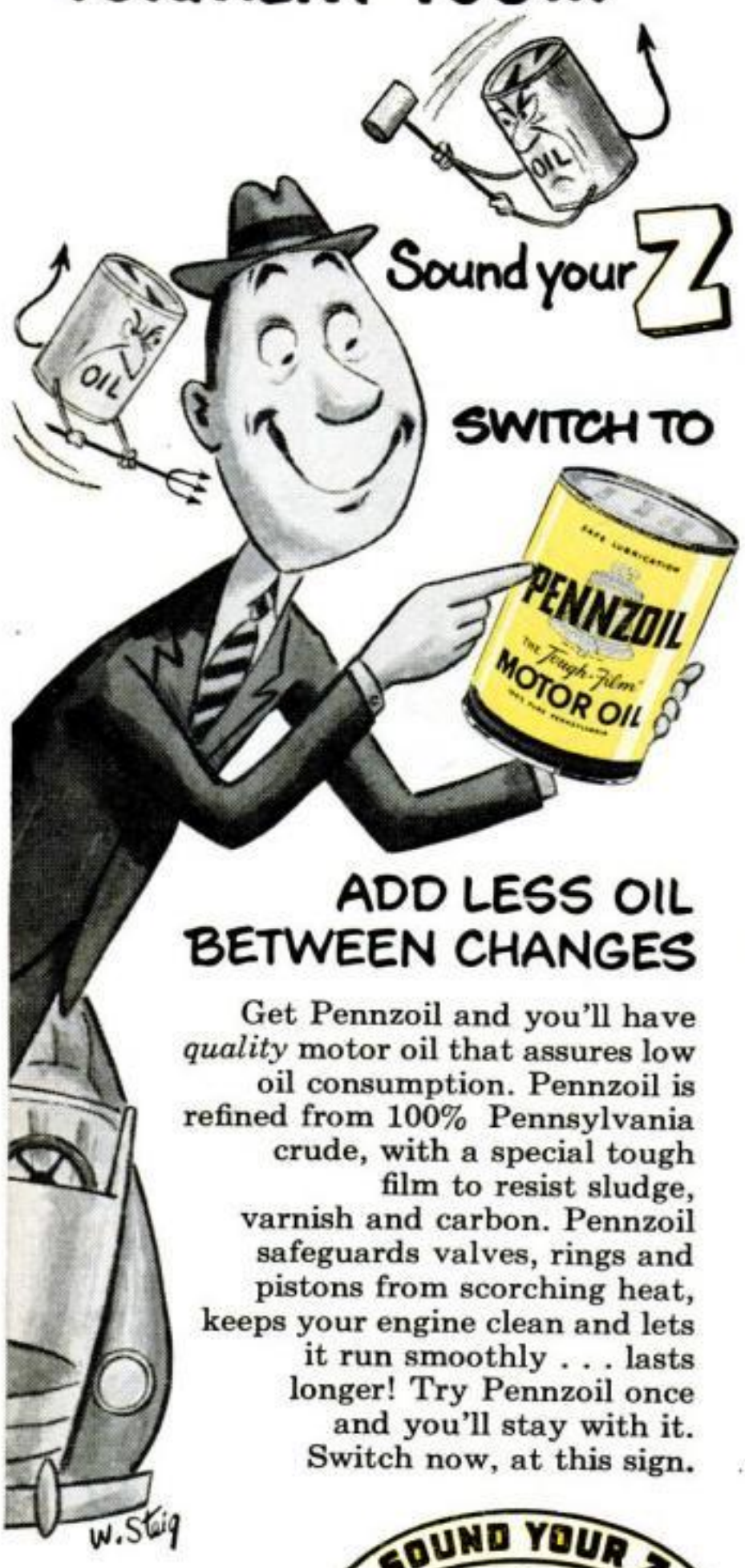
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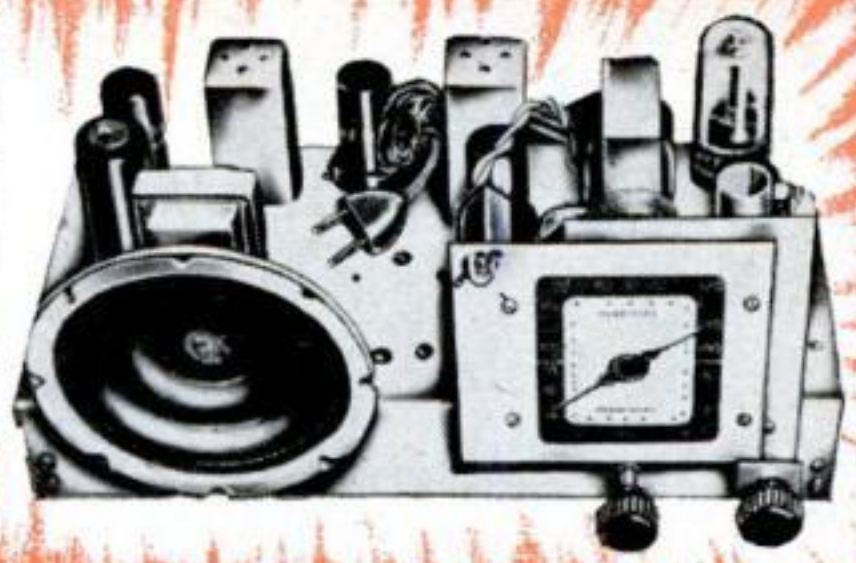
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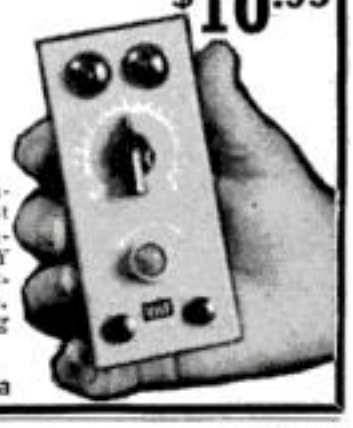
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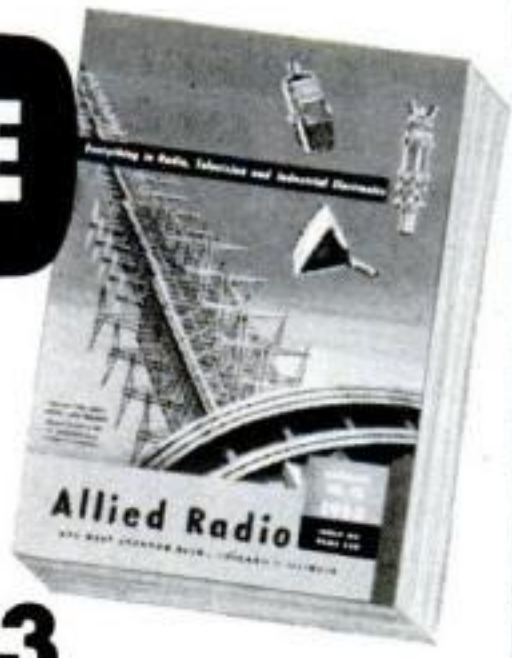


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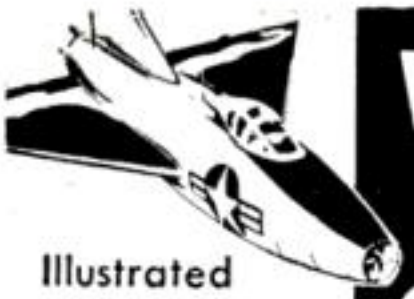
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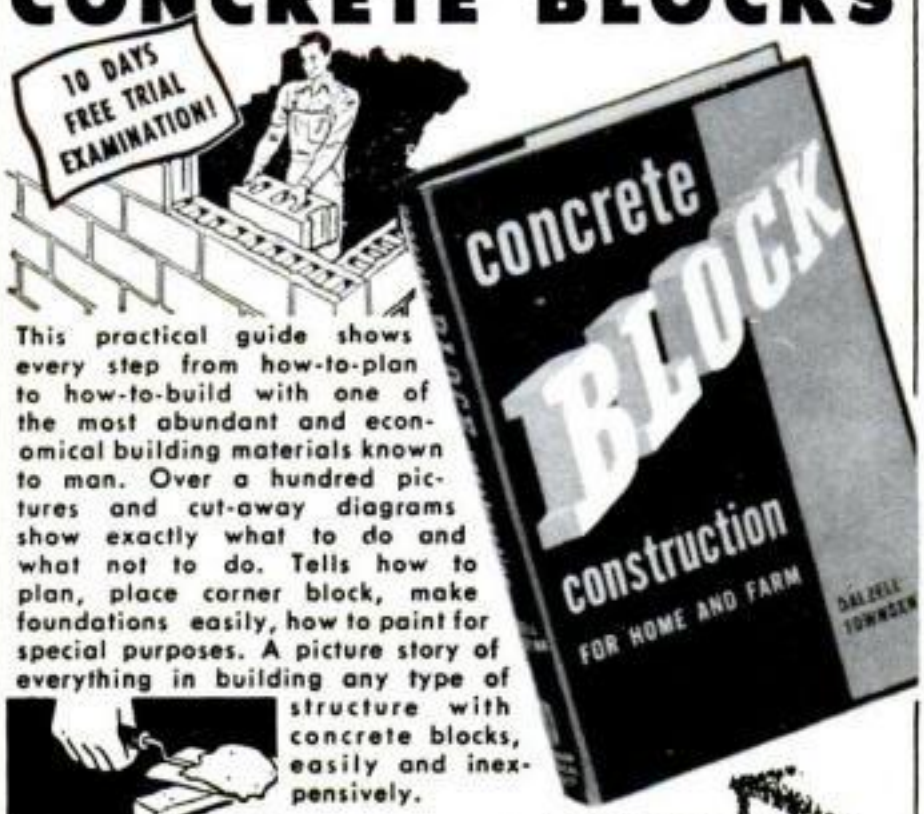
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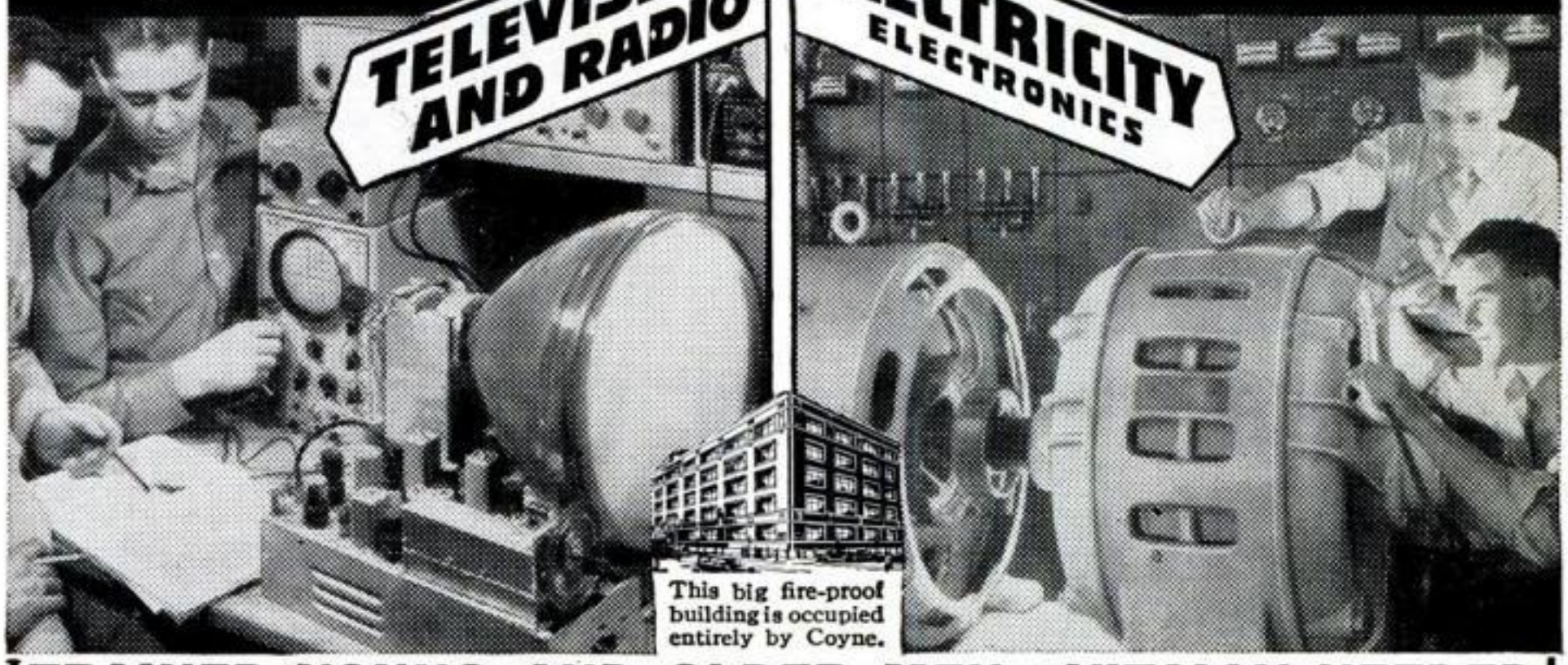
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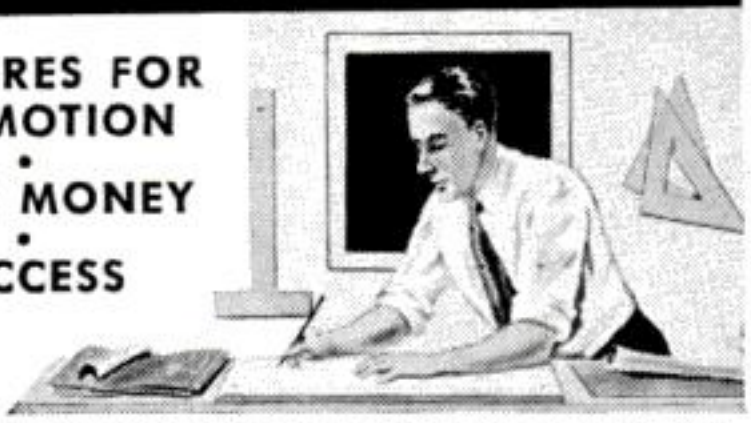
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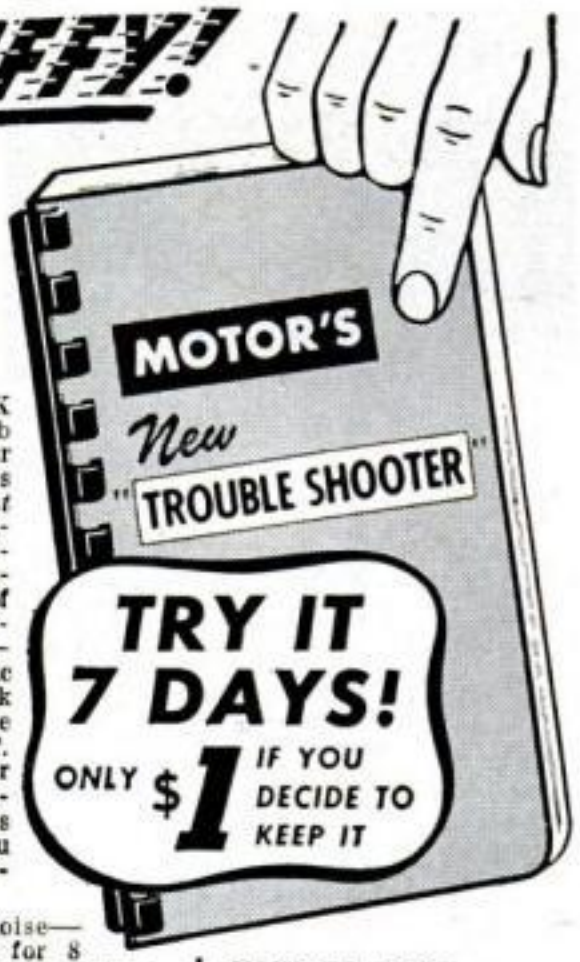
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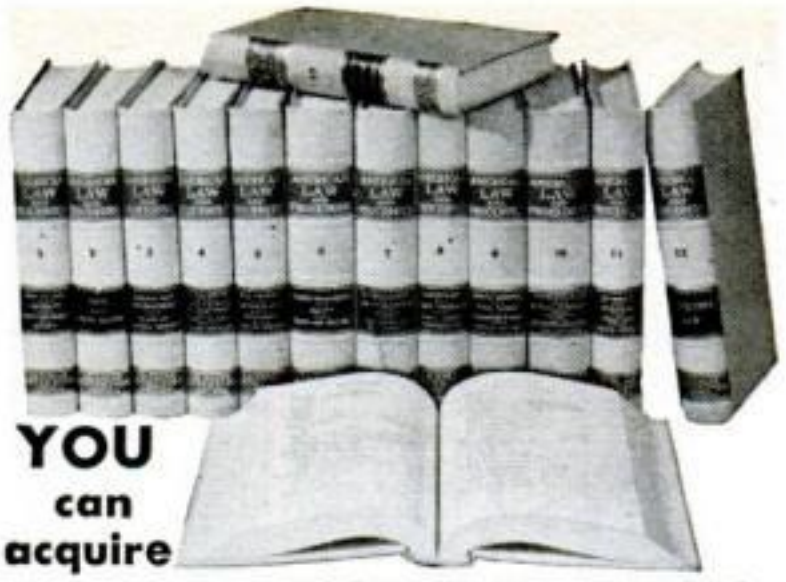
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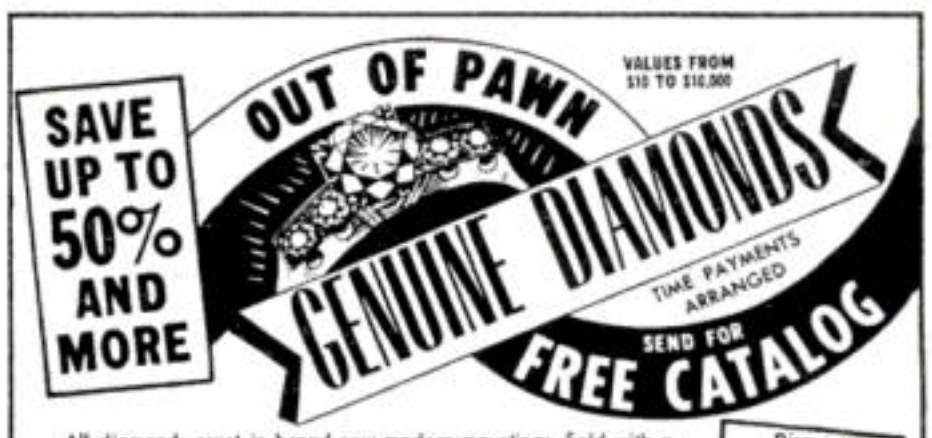
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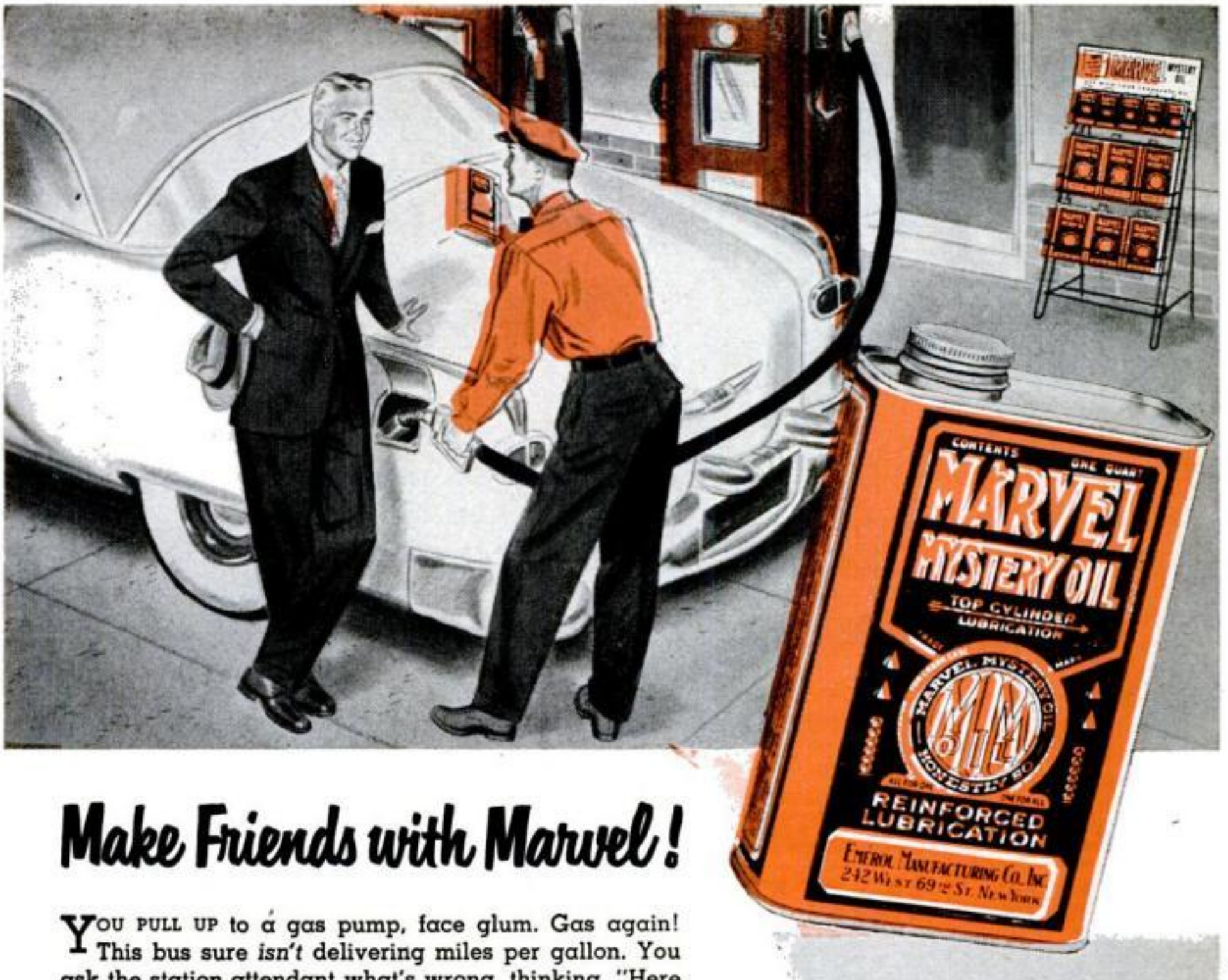

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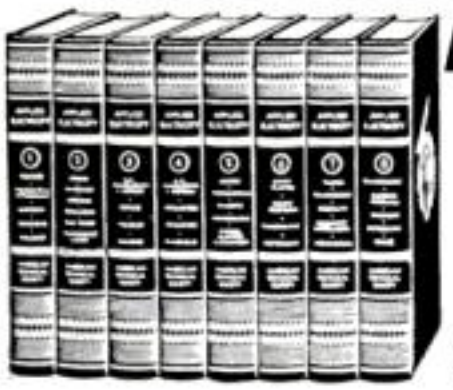
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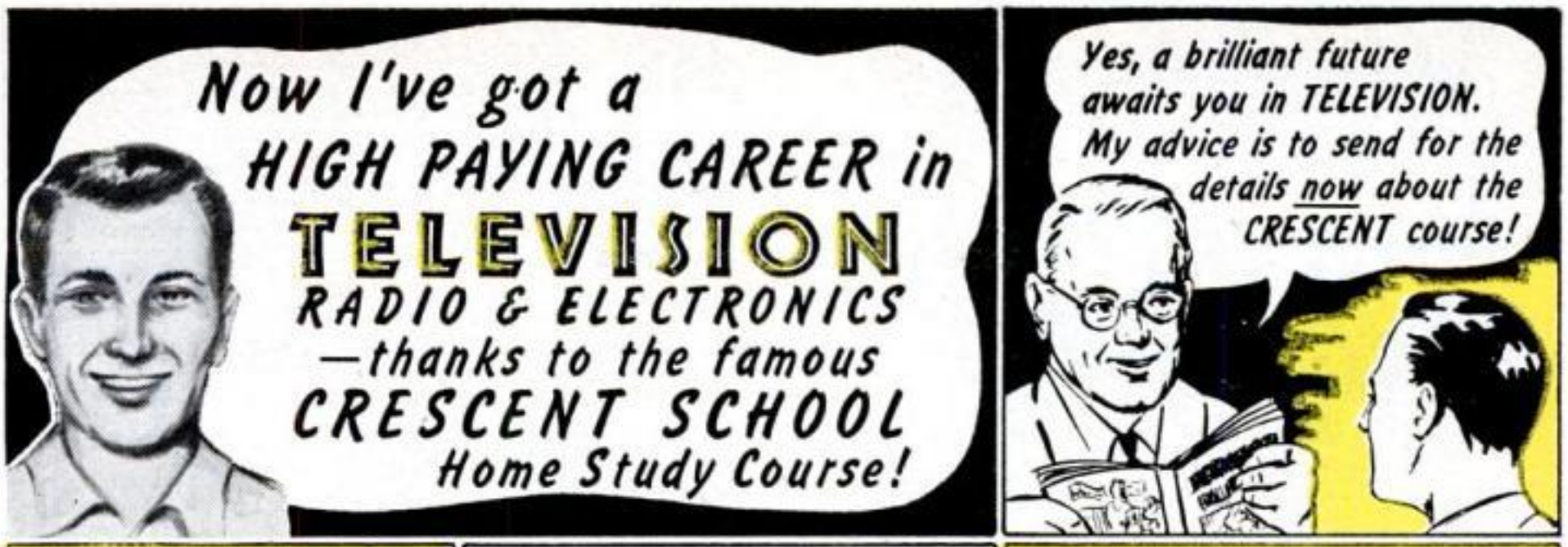

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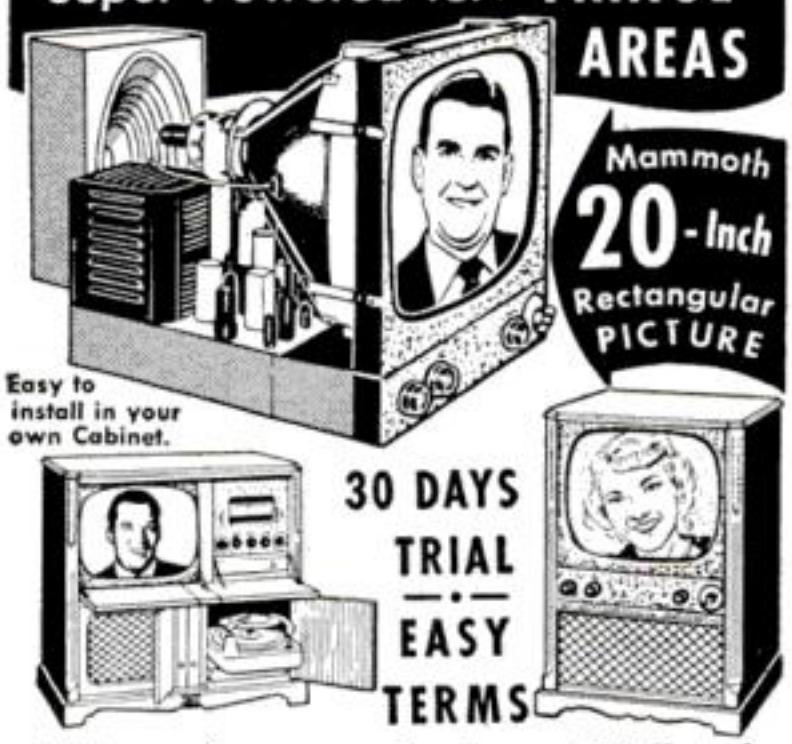
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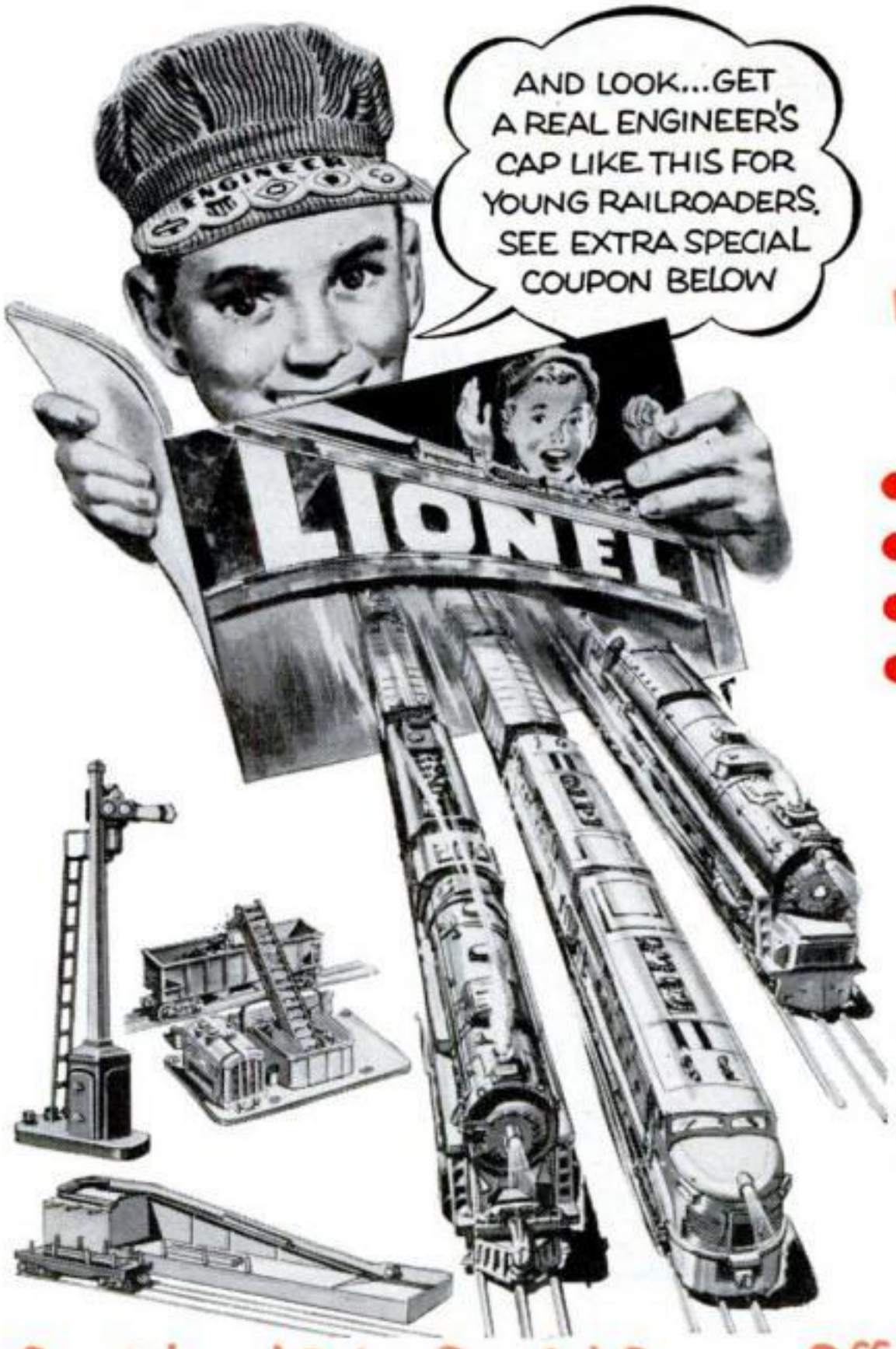
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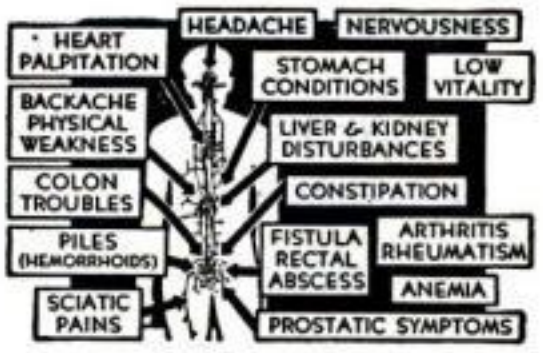
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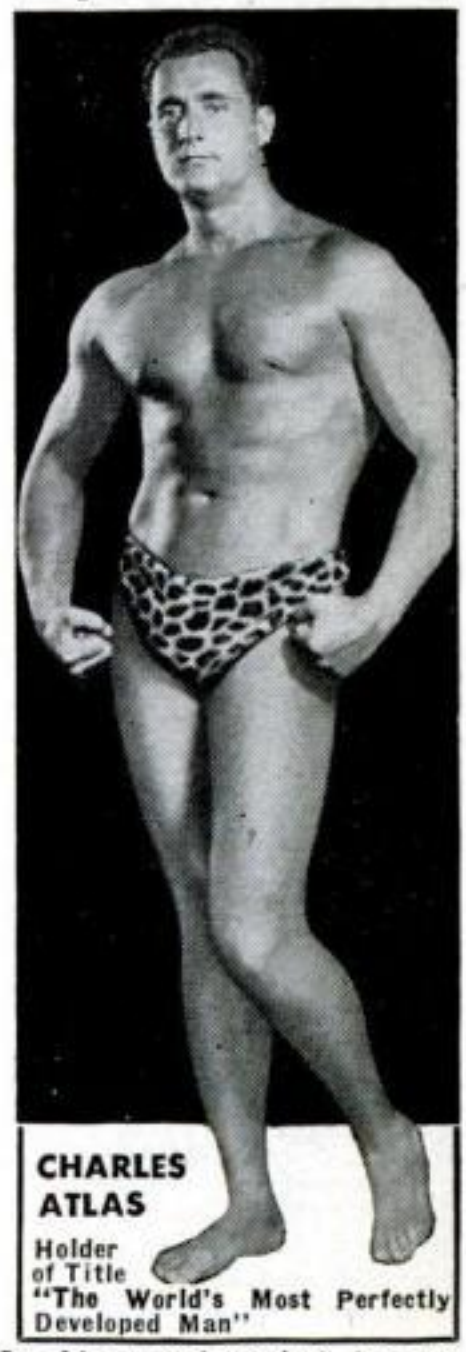
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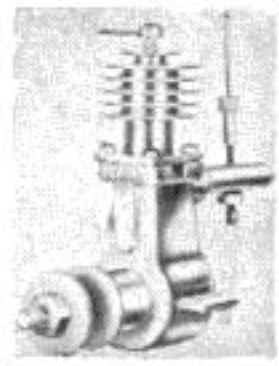

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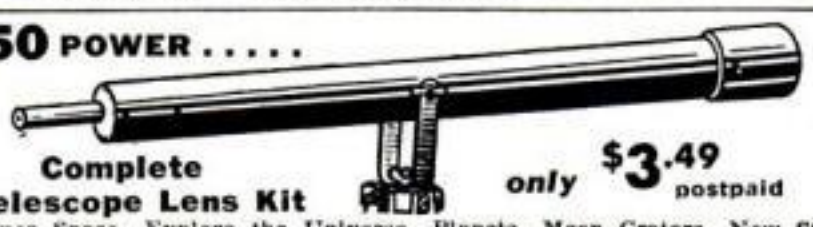
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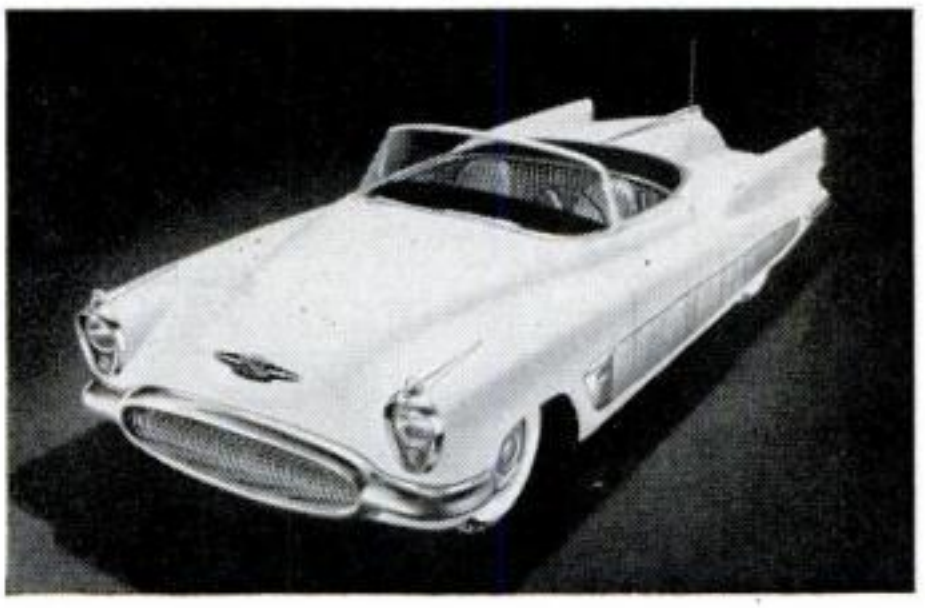
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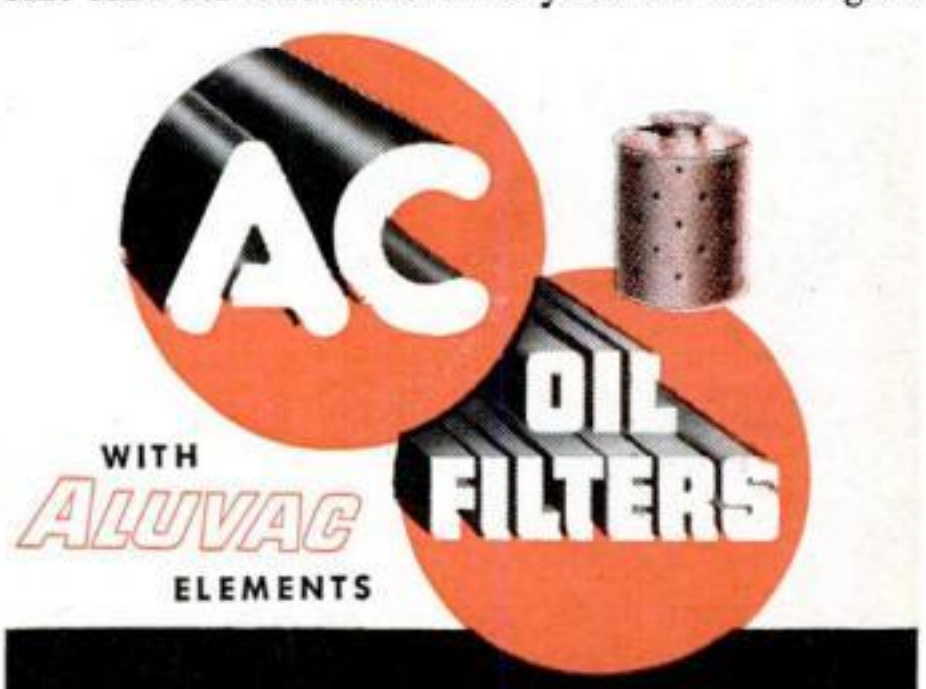
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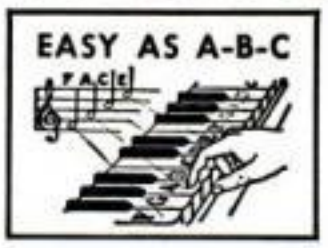
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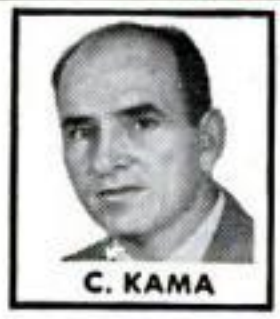
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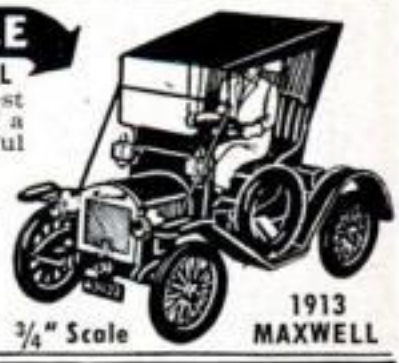
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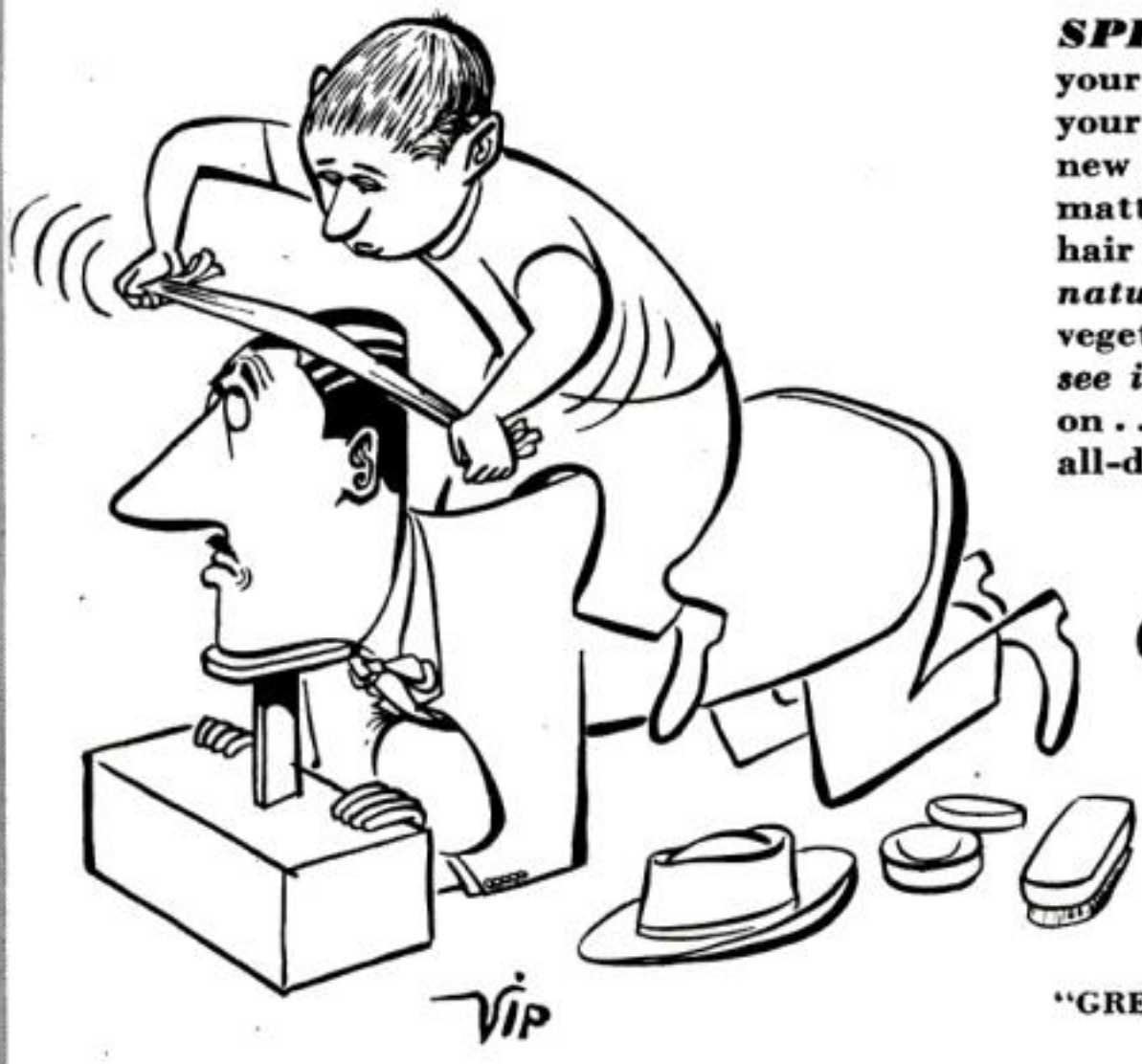
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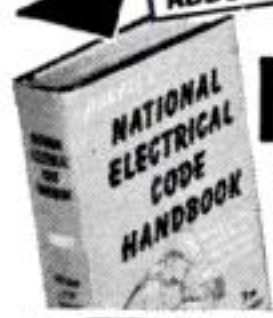
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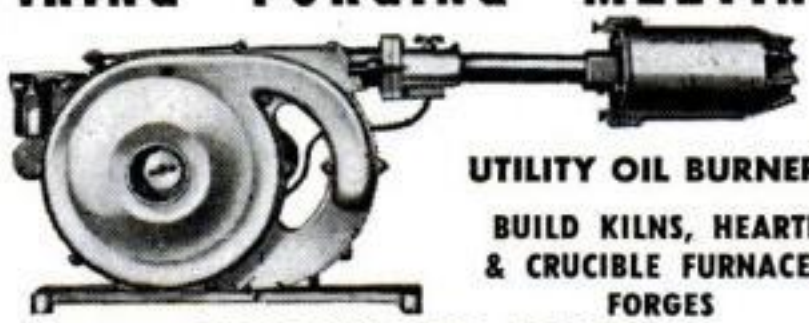
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BIG Money and fun growing Live Miniature Ming Trees on your window sill. Write for Free rare tree seed and plan. National Nursery Gardens, 8463 South Van Ness, Inglewood 4, Calif.

VENDING Machines—A post card may bring you the opportunity you are waiting for. No experience necessary. Stamps, nut, candy, gum and others. Small investment. Write Schoenbach Enterprise, Dept. 9, 1645 Bedford Ave., Brooklyn 25, N. Y.

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EARN $15,000-$30,000 annually. Franchise protected. Guaranteed minimum $12,500 or money back. Live at home. No merchandise to buy. Selfemployed. One of most exclusive and noncompetitive businesses in United States. Send 50c for explanatory book. Money refunded when book returned. Harrell & Company, Box A-2, Louisville, Illinois.

MAKE Rubber Stamps, repair dolls, learn invisible reweaving, repair sewing machines. Catalogue of "40 Ideas." Universal, Box 1076-B, Peoria, Ill.

IMPORT-Export! Opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established World Trader ships instructions for no-risk examination. Experience unnecessary. Free details. Meilinger 19, Los Angeles 24.

POPCORN and Potato Chip equipment. Long Eakins Company, 5263 High, Springfield 99, Ohio.

WATERLESS Hand Cleaners. Highly profitable home mail order and mfg. business. Simply add water to concentrates or ready-packed under your own label. Everything furnished. Western G Aircraft, Los Angeles 19.

SELL By Mail to automobile owners. Millions of prospects. Fast selling items. Everything furnished. Write: Eastern, Box 142-S, Dorchester 24, Mass.

FREE Folder—100 Ways to Make Money in Silk Screen Printing. National, Box 88-PS, Dorchester 22, Mass.

LEARN Sewing Machine Repair. Electrify, Rent, Sell Spare Time. Make "Big Money" like our other Men-Women do. New machines, motors, parts wholesale. Details free. Taylor Service, Hamilton PS-9, Ohio.

LEARN metalizing baby shoes, jewelry, gifts. Bronze gold, silver. Complete success plan free. Kiktavi Building, 7217-PS South Broadway, Los Angeles 3.

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UNPAINTED figurines. No shellac. No lacquer. Write for booklet. Star Novelties, 1470 Washington Ave., New York 56, N. Y.

WANTED! Home Producers, by Manufacturers in our Contact Service. Become a sub-contractor, casting plastic products for these companies. Thousands of easy-to-make items required. Cash in at home, without previous experience. Write for free list of 100 most wanted items. Plastic Service Assoc., Dept, PS9, East Boston 28, Mass.

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OPERATE Profitable Mailorder Business. Particulars Free. George Lenhoff, Lincoln 1, Nebraska.

LIQUID Rubber Make Flexible Molds. Quart $2.95, ½ gallon $4.75. Gallon $8.50 (prepaid). Chaney, 1130 East 16th Street, Jacksonville 6, Florida.

BOOKKEEPERS—Earn $5000 yearly part-time. Sell, operate new sensational CPA bookkeeping service. Kern, 4942A Vineland, North Hollywood, California.

VENDING Machines earn big money! An investment as low as $10.50 will start you in this fascinating profitable business that can lead you to the road of success and independence. Routes can be established and operated in either full or spare time with no experience needed. Write for full details and our Free catalog illustrating our nut, candy, gum and stamp vendors; also pin ball machines, music boxes, etc. Write immediately to Parkway Machine Corporation, Dept. 9, 715 Ensor Street, Baltimore 2, Maryland.

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MAKE Money At Home as renewal headquarters for all magazines. Big Christmas sales profits now. Liberal commissions. Supplies furnished. Write for Free Catalog. McGregor Magazine Agency, Dept. 510B, Mount Morris, Illinois.

MAKE $6.73. You sell one—and they're amazingly easy to sell! We have new Adding Machines in original factory cartons you can sell for only $14.95 and you make 45%. They're executive model portables, precision built with automatic clearance, direct subtraction, fully guaranteed. Send for life size color photo with full details. Write today to Lightning Adding Machine Co., Inc., Dept. P-5, 1260 West Second Street, Los Angeles 26, Calif.

START your own mail order business with hundreds of repeat, sales proven, hobby-craft items. No stock to carry. No shipments to make. We pack and ship for you. For details and instructions send 25c. Mail Order Service, Dept. PS25, 845 S. Wabash, Chicago 5, Illinois.

HAVE Home Mail Business—Success assured beginners with $100 or more. Idea-Mailbox Service. Booklet 25c. Details Free. NMD Agency, Box 88-K, Dorchester 22, Mass.

ALL Profit: Get manufacturer's, distributor's, dealer's profits yourself by making, selling, installing important heating specialties. Details free. Harrington, Box 103SE, St. Matthews, Kentucky.

GET Dollar Orders by Mail—keep 90c. $10 starts You. Details free. Genmerco, Box 142-K, Dorchester 24, Mass.

TO $35.00 Weekly Spare Time, Home Operated Mail Order Business. Successful small "beginner's" plan. Everything Supplied. Lynn, 10420-C National, Los Angeles 34, California.

REPRESENT us in your area. Write for descriptive folder. International Trading Center, 1900 Euclid, Cleveland, Ohio.

FREE Formulas and Instructions for making Newest big profit perfume specialties from Tap Water, DeCasto of Hollywood, P. O Box 447, Hollywood 28, Calif.

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INCOME from local information. No selling. Write—Neherco, La Verne 6, Calif.

MONEY Furnished. Nationally known corporation will buy outright or finance and promote sale on royalty basis of any desirable new device, formula, preparation, cosmetic or invention. Write to President, 10 E. Coulter Street, Phila. 44, Pa.

OPERATE profitable mailorder business write JSSCO, 2623-P Columbus, New Orleans 19, Louisiana.

"MAKE Perfume" Profitable Mailorder business—Catalogue Free. "International," 6347 Parnell—PS-9, Chicago 21, Ill.

MAKE Perfumes At Home. Write, "Carey Laboratories," 1914 Chouteau PS-9, St. Louis 3, Missouri.

MAKE durable plastic—1c pound. Makes attractive floors, walls, built-ins. Build good home, $150.00 room. Bays Laboratory, Oklahoma City 9.



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SMALL investment in Artkote molds, puts you in $5.00 hour stone facing business. Sample mold $2.00. Dividend Company. Liverpool 2. New York.

"PROFITABLE Decorating Business." Fascinating! Instructive. Only $1.00. Fran Council. Box 150-P. Wildwood. New Jersey.

ADDRESS Envelopes. Postals at home—longhand, typewriter. Particulars 3c stamp. G. Torrey. Melrose 76. Mass.

$250 WEEK reported! Free book "505 Odd, Successful Businesses." Work home! Expect something Odd! Pacific-36C Oceanside, California.

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EARN Money At Home With Your Typewriter! Spare time! Details free. Edwards. Publisher. 3915-PS. 12th. Des Moines 13. Ia.

PROFITABLE home business. Electroplate novelties, auto-parts, mirrors, baby shoes, etc. Portable Tyco Electro-Plater $5.95. Free booklet. Tyco Metals. Box 13231-CE. Houston 19. Texas.

HOME Work! Addressing Envelopes. Free Details. Self addressed stamped envelope appreciated. Janosik Service. 5527-X South Sangamon. Chicago 21.

MAKE Money By Mail. Leo Garick. Box 497. Pittsburg. Calif.

INFORMATION: any subject. Reasonable Fee. P. J. Brady. Aberdeen. S. Dak.

BUY Wholesale thousands nationally advertised products at big discount. Sent free. "The Wholesale Plan." American Buyers' Service. 628-S Linden. Buffalo. N. Y.

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MAIL Selling opportunities galore! Free! Wehner. Box 142-E. Roxbury 19. Mass.

FIGURINES unpainted, free illustrated list. Haverty Products, 822-A 17th Street, Altoona, Penna.

$150.00 WEEKLY! Men! Women! Exceptional business! Douglas Service. Cambridge. Minnesota.

DRUG Sundries. All popular brands latex. Fresh stock. Sell to drug stores, physicians and jobbers. Free distributors price list. Sanitary Sales Co., Box 934, Rockford, Illinois.

MEN-Women—"Everybody Likes Candy." Learn to make professionally at home. Tools and supplies. (Our 42nd year.) Ragsdale Candies. East Orange, N. J.

BUILD Own Business. New repeat product. Every home needs. Unusual proposition and sample 25c. Gordon Publishers. Box 23. Pawtucket, Rhode Island.

CLEAN automobiles, wash walls, carpets, upholstery. Complete outfit and instructions. One gallon concentrate—special gun only $9.95. Zipp-reme Chemical Co., Dept. P. Greensburg. Pa.

BUY it wholesale. Manufacturers. Distributors. Over 850,000 items. Literature free. Olsen. 1231-B East Third St., Duluth 5. Minnesota.

SENSIBLE, profitable, delightful business. Trifling capital. Carl Jamer. Manorville 5. New York.

$46 FROM Square Foot Plywood; Jigsaw necessary. Write: Woodart. Bridgewater. Massachusetts.

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THROWN Away! Tons of ground rubber by recappers. Make it into Plastic Rubber! 1,000 uses! Easy! Inexpensive! Start profitable business! Instructions, samples $1.00. Ceeten Products, 506-S. Cornelia, Ga.

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OPERATE "Escalator" Mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Selbyco. Decatur 172. Ill.

FOR as little as $8.00 you can put your ad here in the November issue. Get in on the winter season mail-order rush and deliver your sales talk direct to the 4,000,000 readers of Popular Science. Same low rate you've always paid—80c a word. The November issue closes on September 25th! Write today for order blank and free booklet, "How To Make Money Out of Classified Advertising." O. K. Kelly. Classified Advertising Manager. Popular Science Monthly. Dept. B. 353 Fourth Avenue. New York 10. New York.

## 38 MONEYMAKING OPPORTUNITIES

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SPARETIME Profits Taking Subscriptions All Magazines. Wholesale Catalog Free. Cassell Publishers. Westfield 1. N. J.

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MAKE Money—Sewing and Assembling at Home. Liebig Industries. Beaver Dam 7. Wisconsin.

$35 WEEKLY addressing envelopes. Instructions $1, refundable. Adservice. Spring Valley 36. New York.

595 MONEY making secrets. Send stamp. Book Service. P. O. Box 453. Port Chester. New York.

$100-$200 WEEKENDS no selling or manufacturing. Brennan. 4025-Y Lankershim. North Hollywood. Calif.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner. P-125 West 86th. N. Y. 24.

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SELL Titania Gems $9.75 Carat. Wholesale. More brilliant than diamonds. Free catalogue. Diamonite. 1404S Mitchell. Oakland 7. Calif.

BE Self Employed—Details—Boyen. 51-56 48th Street. Woodside 77. New York.

SCHOOL Seniors—Earn sensational profits selling classmates America's Most Beautiful Graduation Name Cards. Largest selection. Outsells all others. Free sample kit. Printcraft. Dept. P. 1509 Maple Street. Scranton 5. Pa.

TYPEWRITER Owners make handsome profits. Get details today. Groves Company. 682. Hastings 3. Nebraska.

WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests. 1609-A East 5th. Duluth. Minnesota.

HOW to get your mail order advertising Free revealed by famous expert. Also other "Inside" secrets. Free details. Benson Barrett. 1751-B2 Morse. Chicago 26.

WORK at home. You sell nothing. For $3.00 we start you. Possible to make $191.00 in five hours daily. School children making up to $100.00 weekly. Send your order Now. John Rodakowski. Route 1. Box 79. Springfield. Oregon.

EARN Money Evenings, copying and duplicating comic cartoons for advertisers. Adservice. Argyle 2. Wisconsin.

$$$ IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro. Oakland 6-P. Calif.

START a buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Send postcard for details. American Buyers' Service. 631-T Linden. Buffalo. New York.

FREE Book "505 Odd, Successful Businesses." Work Home! Expect something Odd! Pacific-35C. Oceanside. Calif.

MAKE Big Money at Home. Inexpensive. Box 475. Lomita. California.

SILK Screen Printing. Growing opportunities everywhere. Write Typecrafters. 510 West Susquehanna. Philadelphia 22. Pennsylvania.

WE pay you highest rates for hand-decorating greeting cards. Work home. Experience unnecessary. No selling required. Greetings, 100 Madison. Detroit 26.

MANUFACTURE Rhinestone and Pearl Jewelry at home. Latest creations, tremendous profits, no skill needed. Postcard brings illustrated catalog of settings, stones, etc. A. V. Cutt Co., Inc., 210-H Fifth Ave., New York 10. New York.

HELPFUL information. Sell by mail. 12 tested plans. 25c. Edwards. Box 1067. Allen Park. Michigan.

FOR as little as $8.00 you can put your ad here in the November issue. Get in on the winter season mail-order rush and deliver your sales talk direct to the 4,000,000 readers of Popular Science. Same low rate you've always paid—80c a word. The November issue closes on September 25th! Write today for order blank and free booklet, "How To Make Money Out of Classified Advertising." O. K. Kelly. Classified Advertising Manager. Popular Science Monthly. Dept. B. 353 Fourth Avenue. New York 10. New York.

## 39 FORMULAS, PLANS, ETC.

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BRAND New. Spectacular Chemical and Fireworks Experiments Manual. Complete Set-ups. Instructions $1.00. Chemi-Technix Laboratories. 568M Riley Street. Buffalo 8. New York.

500 FORMULAS and Recipes. Riches in Recipes. Tried and Tested processes for home. Factory and workshop. 25c postpaid. Allen. 427-PS. Clinton. Missouri.

BOOK—10,000 Formulas, Processes. $3.98 Postpaid. Free literature. Kenneth Paullin. Loudonville. Ohio.

ONE tube loudspeaker radio diagrams 25c. Net-Loc. 44 Walker. Cambridge 38. Mass.

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FREE Formula Catalog anything analyzed $25. Western Chemical. Salem. Ore.

LABORATORY tested formulas. Lists free. Pont. Box 635-PS. Terre Haute. Ind.

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NEW liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Wholesale Catalog and New Sales Manual showing how to make money at home. Castolite. Dept. K-102. Woodstock. Illinois.

HI-Profits-Gifts-Jewelry. Free Catalogue, details. Pilot Plastics. 67-A Fulton St., New York City 38.



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REINFORCED Plastics including miracle Fiber Glass. Send 25c for sample, information, and project lesson. Mardon Reinforced Plastics, Box 489, Glen Cove, N. Y.

PLASTICS. Lucite, Plexiglas. Acetates, complete supplies. Retail-wholesale prices. Catalog 10c. Gem-O'-Lite, Box 686N, North Hollywood, Calif.

LUCITE, Plexiglas, Jewelry Findings, Internal Carving, Fabricating. Free Lists Material and Supplies. Caraday, Box 71, Brooklyn 34, New York.

## 41 CHEMICALS & APPARATUS

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

NEW Idea Chemical and Apparatus Outfits for Home Experimenting. Photo-Scales, Microscopes, Chemicals, Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York 11, N. Y.

AMATEUR Chemists—If you have your own lab, write for free copy of our monthly paper. The Amateur Chemist, Westwood, Lassen County, California.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology. 10c. Tracey Laboratories, Evanston, Illinois.

SAVE Money! Supplies Catalog 20c, refundable. Laboratory Sales, Box 161-G, Brighton, Mass.

LABORATORY Apparatus, Chemicals, Microscopes. Complete Chemistry Sets, Minerals, Uranium Ore. 10c brings catalog. Porter Chemical Company, Hagerstown 2, Maryland.

BRAND New, Spectacular Chemical and Fireworks Experiments Manual. Complete Set-ups, Instructions $1.00. Chemi-Technix Laboratories, 568M Riley Street, Buffalo 8, New York.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 20c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

AMAZING New Book of Science, Experiments, Formulas and catalogue of Laboratory Supplies. Only 25c: National Scientific Co., Dept. 15, 2204 W. North Ave., Chicago 47, Illinois.

URANIUM Ore, Weighing Scale, Graduate, directions for 44 experiments, $1.00. Rex Laboratories, 2849-B Birchwood, Chicago 45, Illinois.

## 42 HELP WANTED

FOREIGN & Latin American Employment 1952 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring. $1.00 post-paid. Global Reports, P.O. Box 883-S, Hollywood 28, Calif.

FOREIGN Employment Construction men, building trades, helpers, office men, others, interested in Foreign Projects. High wages, quarters, transportation. Send $1 for Foreign Construction Compendium and Application Forms. Foreign Service Bureau, Dept. PS-9, Metuchen, New Jersey. (Not an employment Agency—no fees.)

$1,000,000 CONSTRUCTION Projects, "World Wide" printed Monthly Foreign & Domestic employment. Free application blanks tells How-When-Where to apply. $1.00 complete. Global Reports, P.O. Box 883-PX, Hollywood 28, California.

ALASKA—Last American Frontier. $1.00 brings 1952 Business Directory, Government Map, Construction Projects Military & Civilian, Homestead & Highway facts, Hunting-Fishing-Game Rules, Mining, Aviation, List of firms hiring, How-When-Where to apply. Alaska Opportunist, P. O. Box 883-S, Hollywood 28, California.

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OVERSEAS Jobs. Mechanical, clerical, professional workers, others interested overseas jobs. Big pay, transportation, expenses. Send $1.00 for "Overseas Jobs Brochure" and application forms. Overseas Jobs, Dept. 335-B1, Baton Rouge, La. (Not an employment agency—no fees.)

CONSTRUCTION Job List. Published Monthly. $1.00. Dempster's Construction Scout News, Dept. 268-DO, Bridgeport, Illinois.

BOOKKEEPERS earn $100.00 weekly operating simplified Bookkeeping-Tax Service. Details free. Universal, Box 664-P, Springfield, Missouri.

## 43 AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 18, Chicago 4, Illinois.

MAKE Wedding Profits. Sell invitations, napkins, matches. Samples free. Dunbar's, Middlebush 5, N. J.

PRINTING — Salesbooks — Envelopes. Free Illustrated Catalog—Ersco, Dept. S, Bronx 72, New York.

GOLD Lacquered and silver sign letters, Windows, doors, trucks. Standard Sizes, Penny and up. Samples. Atlas-G, 544 West 79th, Chicago 20.

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CASH in on your spare time! Sell beautiful new Regal Christmas Greeting Cards and Gift Assortments. No experience necessary. Costs nothing to get started. Show wonderful samples to friends, relatives, neighbors. Merely take orders and pocket up to 100% profit. Write today for samples on approval. Regal Greetings, Dept. 104, Ferndale, Michigan.

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FAST sellers. Big demand. Catalog. Parker Drug Co., Hoboken 6, New Jersey.

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BIG Bargains! Terrific Profits! Selling new-used Clothing. Suits $1.75, Pants 35c. Topcoats $1.00, Dresses 20c. Shoes 20c. As little as $10 starts you. No experience necessary. Free Wholesale Catalog. Superior, 1250-B Jefferson, Chicago 7.

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I'LL put a "Shoe Store Business" in your pocket! Nation's Leader trains you to make Big Money! Fit men, women. Free Sample Outfit—Write Today! Mason Shoe Co., Dept. MA-14, Chippewa Falls, Wis.

CALIFORNIA sweet smelling beads, sensational sellers. Particulars free. Mission, 2328P West Pico, Los Angeles 6, Calif.

NEED Extra Cash? Free Sales Kit. Sell personal initialed buckles with belts, cap badges, tie clasps etc. Choose from 3000 emblems. Hook-Fast, Box 1425PS, Providence, Rhode Island.

ANYONE can sell Hoover DuPont Nylon Uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. E-101, New York 11, N. Y.

GET Into Million Dollar Work Clothes Business. Earn big money now, unlimited future! Sell finest-quality embroidered uniforms and work clothes to factories, garages, everybody! Huge profits possible. No experience needed. Gorgeous selling kit, actual fabric samples, including miracle Orlon! Everything Free! Write Topps, Dept. 549, Rochester, Indiana.

PHOTO-Salesmen-Agents. Sell beautiful hand colored plastic enlargements and sensational new photo compacts, rings, bracelets, lockets etc. Collect deposit, we deliver. Profitable sideline. Send card for Free sample kit. Novel Portrait Co., 3343-A North Ave., Chicago, Ill.

MAKE big money—season starting—sell 1953 calendars advertising specialties and executive gift line. Experience unnecessary. Commissions advanced. Outfit Free. North American Calendar, 605-AB Washington, Chicago 6.

WOMEN! Men! Make extra money in your spare time. No house-to-house canvassing required. New car given as bonus. Amazing nylons guaranteed as long as 9 months depending on quantity, against runs, snags, holes, or replaced free. Rush name and hose size for simple money making plan. Lowell Wilkin, 2029 Wash., Greenfield, Ohio.



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WANT to make real money? You can positively make $50.00 a day and up selling a brand new item going to every type of Food and Beverage Store, Factories, Laboratories, Hospitals, etc. First time advertised. Samples furnished. Utility Durawear, 53 West Jackson Blvd., Dept. PS-9, Chicago 4, Illinois.

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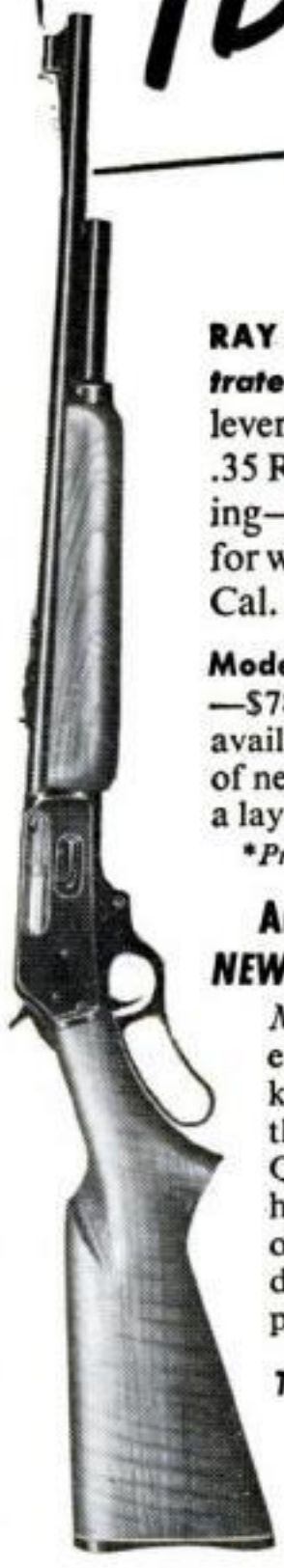
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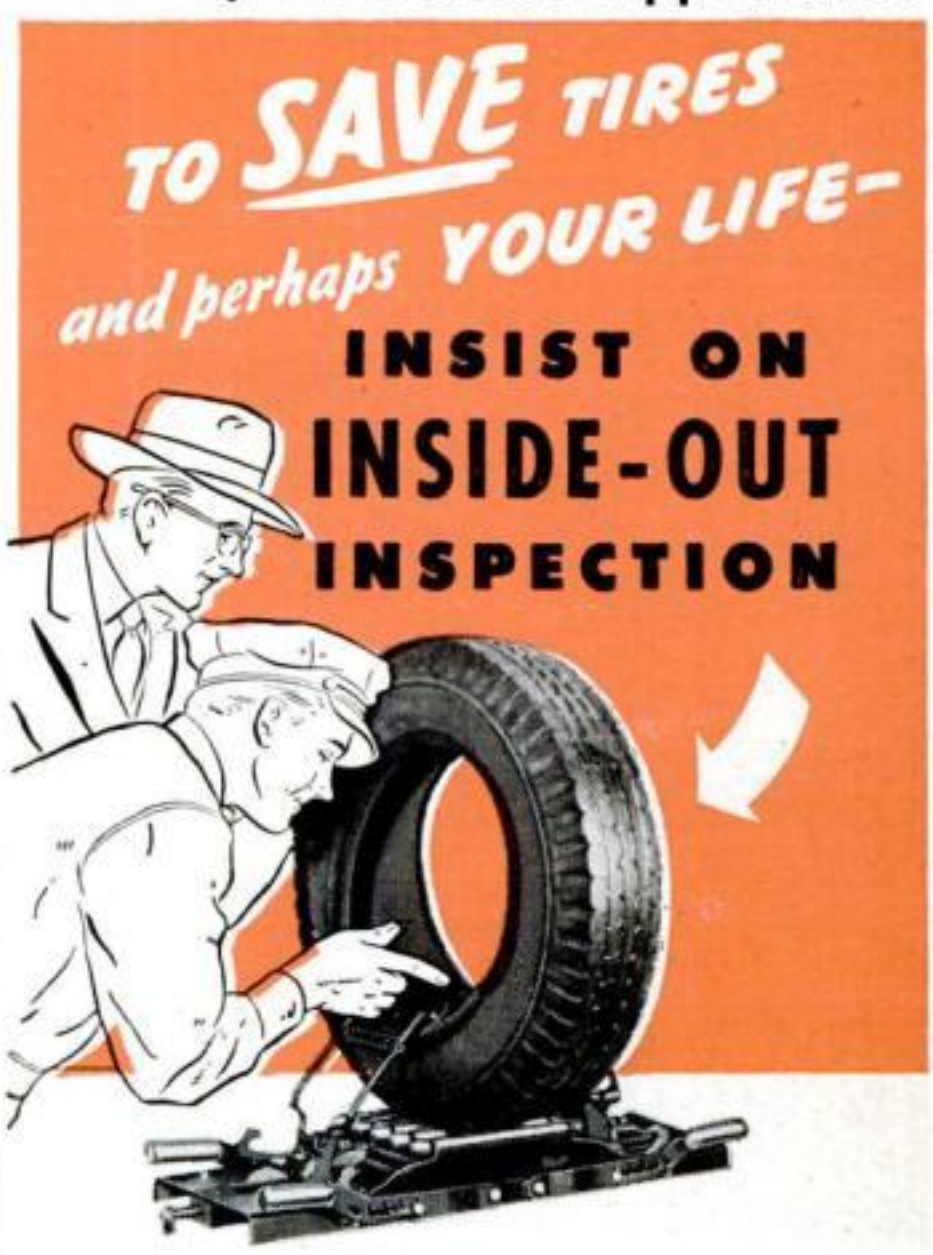
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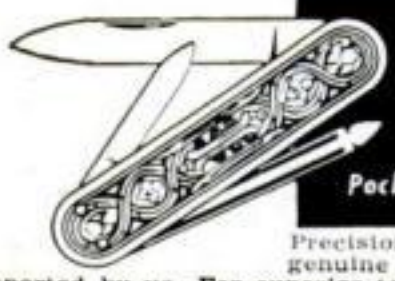
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# Excitingly styled new Studebaker saves gas amazingly

THE JET-STREAMED look of the new Studebaker tips you off to one secret of its gas economy.

The whole car is trim and sleek—free from power-wasting excess weight.

Thanks to this advantage, a Studebaker Champion and Commander V-8 finished first and second in actual gas mileage—ahead of all standard class cars competing in this year's Mobilgas Economy Run.

Like most of the contenders, the Studebakers used Overdrive. It's available at extra cost—and so is Studebaker Automatic Drive. Try out a thrifty Studebaker right away.

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*One hundred years of progress on the roadways of the world*



**Sleek "swept-back" lines are a Studebaker style mark. Get a Commander V-8—or a Champion in lowest price field.**

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POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly



At filter center (above), reports of observers are plotted on grid boards and evaluated.

# You, Too, Can Shoot a Plane

***As a civilian spotter or plotter, your "flash" report may trigger the guns that will down an enemy bomber.***

**By Herbert O. Johansen**
PSM PHOTOS BY W. W. MORRIS

ENEMY bombers can get through. The radar net guarding our coasts and borders is uncanny in its sky-scanning vigilance. But there isn't enough of it—and it has loopholes. Low-flying planes, for instance, can sneak under its bouncing electronic beams of vision.

That's why the Air Force wants a million civilian human eyes peering through those loopholes—24 hours a day—to help spot in time any airborne atom bomb intended for New York, Pittsburgh, Detroit, Washington, Seattle, Wichita or any other target.

Those million eyes would belong to



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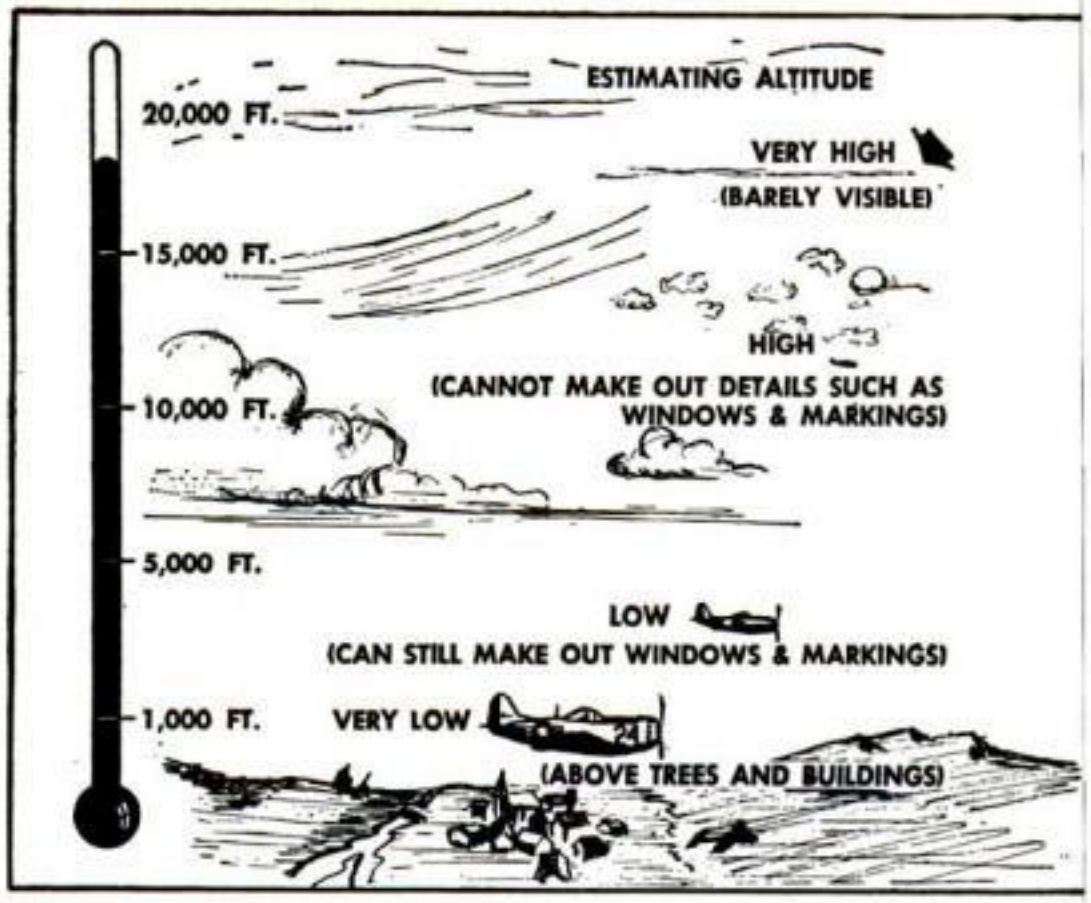



**SPECIAL AIR FORCE WINGS are awarded to men and women of the Ground Observer Corps.**

500,000 volunteer members of the Ground Observer Corps. They would man 19,400 spotters' observation posts and 17 evaluating filter centers in 27 states.

The Ground Observer Corps was organized two years ago and has been on a stand-by and training basis, taking part in periodic alert exercises. Now these civilian volunteers are being mobilized as an around-the-clock operation. Here is why:

- For the first time in U. S. history, a potential enemy with aggressive ambitions has the atomic bomb and long-range bombers capable of reaching our shores.
- There is no assurance that the nation's air defense will have advance warning of an attempted assault—hence the urgency of a system that can detect and track enemy aircraft from the moment they cross our borders.




**TRAINING CHART helps spotters determine altitude of planes. Spotters do not have to be aircraft-identification experts. They report planes only by general type.**

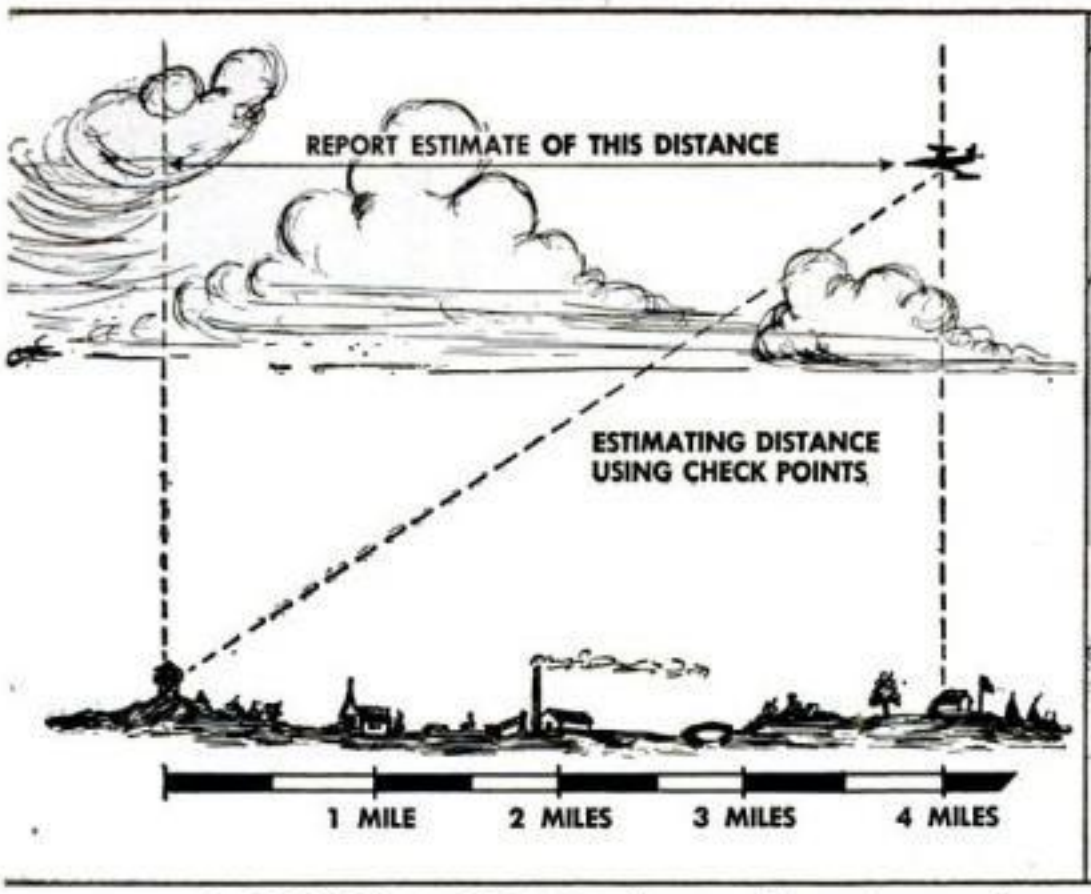
Our only weapons, should they penetrate our outer defenses, are Army antiaircraft and the guns, cannon and rockets of our fast jet interceptors. These guns, says the Air Force, are literally at the beck and call of the civilian volunteers of the Ground Observer Corps.

**1 GROUND OBSERVATION POSTS are located about eight miles apart, high above the ground like this one on top of the bell tower of the Maryknoll Seminary at Ossining, N. Y. Others are on top of office buildings, firehouses, forest-ranger and Coast Guard stations, even on top of a racetrack grandstand. Visibility must be at least four miles.**

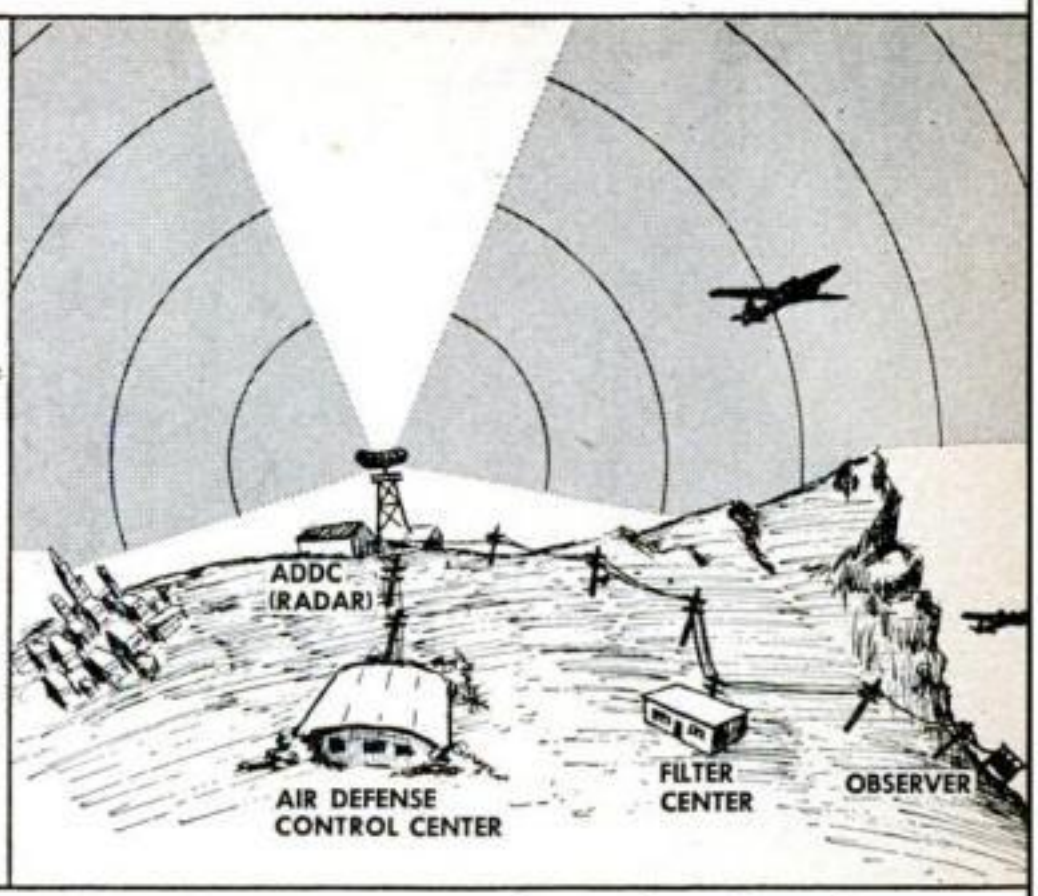
**2 A MULTIMOTOR AIRPLANE has been spotted by Ossining Supervisor William Nowller. Another observer (in booth) phones report to filter center in nearby White Plains: "Aircraft Flash—one multimotor—low—no delay —Baker Mike Zero Zero Red—west two miles —flying south." On parapet is one of Maryknoll brothers who help out in observing.**








**A PLANE'S DISTANCE** from the observation post is another important reporting factor. Here is how spotters use familiar landmarks at known distances to establish location.




**RADAR LOOPHOLES** are shown here by white areas. Near center of drawing above is the vertical cone of "radar silence." Low altitudes are another radar weakness.

Today some 150,000 of the volunteers are trying to bring into being the Air Force's Operation Skywatch. They need help to protect your home, your life and your way of living. There is no pay or glory. But certainly there is incentive in the thought that one atom-carrying bomber packs the destructive power of 150 World War II bombers.

Any individual volunteer's "Aircraft Flash" might be the one saving an entire city, possibly hundreds of miles away. These pictures show you how the volunteers help the airmen.

**3** **PLOTTER** at Air Force filter center takes the incoming call with "Air Defense, go ahead." She (or he) then records the spotter's information on a "pip" (shown in close-up in next photo) and places it on a grid board, pointing south and "two miles west" of a circle locating the Ossining Observation Post Baker (B) Mike (M) Zero Zero Red.

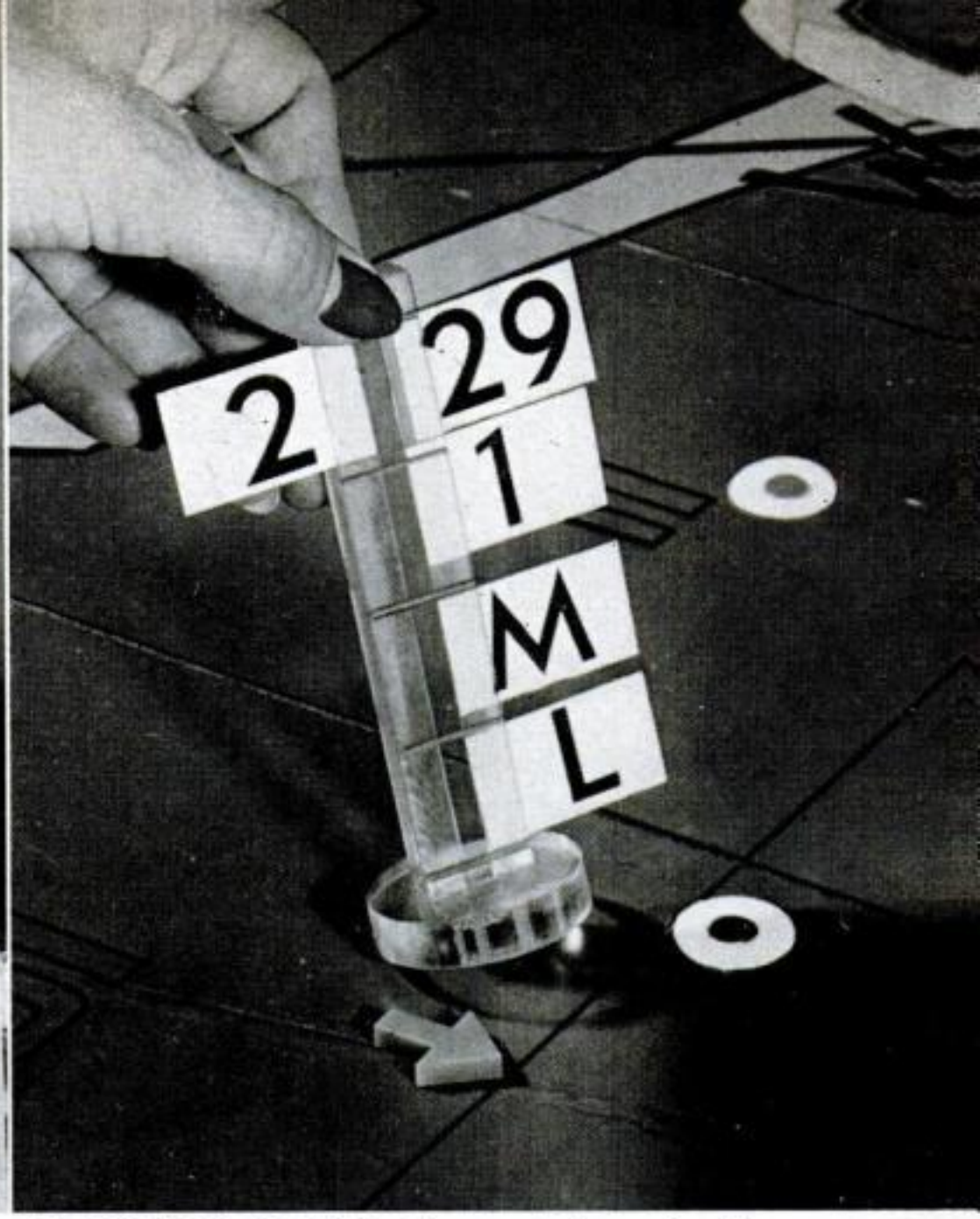
**4** **THE PIP** has four movable sections on which the spotter's information is recorded, as below: 1 (one), M (multimotor), L (low-flying). By turning these sections, the plotter can make the pip indicate various numbers of aircraft, different types and different altitudes. *(Please turn the page for more Ground Observer Corps photos.)*








**5 IF THE PIP INFORMATION** is established as a "track," or new flight, a filterer calls for a "raid stand." Above a clerk is preparing a raid stand with the information: one—multi—low. At top has been added a track number, which will identify the flight as reports from spotters at other observation posts move it across the filter-map table.




**6 THE RAID STAND** is then put down in place of the pip along with an arrow to show direction. Before establishing a track this way, however, the filterer must compare pip information with other information already on the board. It might not be a new flight but part of a track previously established, in which case that raid stand is moved forward.

**9 AIR FORCE COMBAT ALERT CENTERS,** such as one below, never sleep. Their job is to send up jet interceptors to investigate any unidentified plane within their area of operation. With the Ground Observer Corps on 24-hour duty, there is less chance of an enemy plane getting by. Here, our observer's report, one—multi—low, has just been received.





**7** **"TELLERS,"** seated on a balcony above the plotting boards, watch the raid stands and report the information they display and their movements by direct wire to Air Defense Direction Center (ADDC). Above, a teller has phoned in our one—multi—low, and its position and track number. Recorder at right tabulates all information reported to ADDC.



**8** **AIRMEN PLOT** information received at ADDC from the filter-center tellers on transparent vertical boards. This is checked against information of airplane flights already received by radar and other means. If our one—multi—low is unidentified along the flight track reported and is considered a threat, jet interceptors are notified.

**10** **PILOT AND HIS RADARMAN** dash for their F-94 all-weather jet interceptor. Only minutes have passed since the observer on top of the Maryknoll bell tower phoned in his one—multi—low report to the filter center. Fortunately, in this case, the unidentified plane was a friendly one. But it might have been an enemy atom-carrying bomber. END



# "World's Finest" New Tank Puts on Show of Strength

RUGGED, fast and full of fight, like the scrappy general for whom it was named, the Army's newest tank, the Patton 48, is now streaming off production lines at several great plants. Frank Pace Jr., Secretary of the Army, calls it the world's best medium tank.

Shells are more likely to glance off the Patton 48's sloping hull and egg-shaped turret—single pieces of armor casting—than they are to penetrate them.

The new tank's formidable armament includes a high-velocity 90-mm. gun with a removable tube for quick replacement in the field, as well as both .50- and .30-caliber machine guns. Powered by an 810-horsepower, air-cooled V-12 engine with cross-drive transmission, the Patton 48 is both speedy and highly maneuverable. Chrysler, Ford and General Motors are now working simultaneously in production of the new medium tank.



**MIGHTY AGILE** for its weight, 45 to 50 tons, the Patton 48 easily climbs a three-foot wall.



**SURFACING** after a plunge into four feet of water. Wide treads give it greater "flotation."

## Trains Provide Their Own Moonlight for Night Rides

FOUR floodlights mounted in batteries on the roofs of B & O strata-dome cars enable passengers traveling on that railroad between Washington and Chicago to see the immediate countryside clearly at night. The lights, throwing diffused beams, illuminate the passing scene along the right-hand side of the track.





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Strictly for show, a line of the new four-man Patton 48s rumbles forward into mock battle.



**HULL'S EGG SHAPE** is clearly seen here. Cupola machine gun is loaded and fired from inside.



**FOUR TELEPHONE POLES** are knocked galley-west by a Patton 48 with its turret reversed.

## Baby Planetarium Ably Imitates Its Big Brothers

ONE-QUARTER the size of a typical commercial planetarium and 100 times cheaper, the miniature model shown at right nevertheless reproduces all the stars visible under normal conditions from any spot on earth at any date—past, present or future. Light shining through precisely positioned holes in a hollow metal dodecahedron (12-sided object) projects the stars on a plastic dome 20 feet in diameter. Auxiliary projectors can be added to show sun, moon and planets.

Spitz Laboratories of Philadelphia developed the planetarium.





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# He Makes Shop Jokes Pay

By Edward Hutchings Jr.

***This correspondence-school cartoonist has found fun, fame and fortune in memories of his days as a skilled machinist.***

"MY KIDS think I'm just a plain cartoonist," Jim Williams once explained to a friend. "They don't realize I could still make a good living as a machinist."

This is an odd statement to come from one of America's popular newspaper cartoonists. But Jim Williams is prouder of being able to build a locomotive than of his knack of producing cartoons.

He has proved that he can do both. In the last 30 years J. R. (for James Robert) Williams has drawn more than 10,000 "Out Our Way" pictures. These appear, at the rate of one a day, in over 1,000 newspapers

**WILLIAMS' FAVORITES among his 2,500 machine-shop cartoons are the two at right. His star character, The Bull of the Woods, is modeled on the foreman he once worked for.**

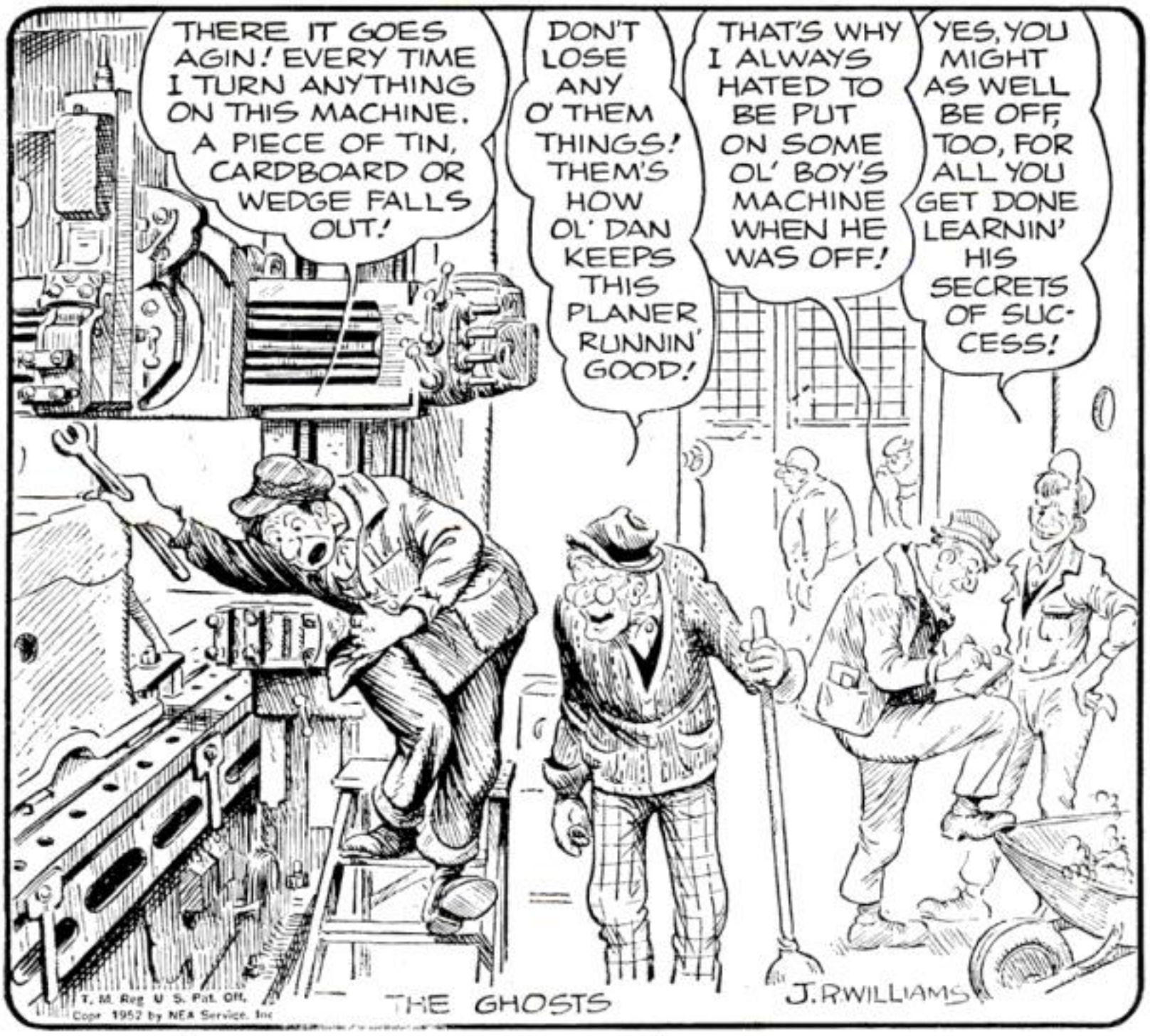
**IN HIS OWN SHOP** Jim Williams pats a papier-maché reindeer (below) that is part of a display he is making to string up between two trees on his lawn next Christmas. Here, in his garage, he spends what time he can spare from the daily stint of drawing his cartoons.





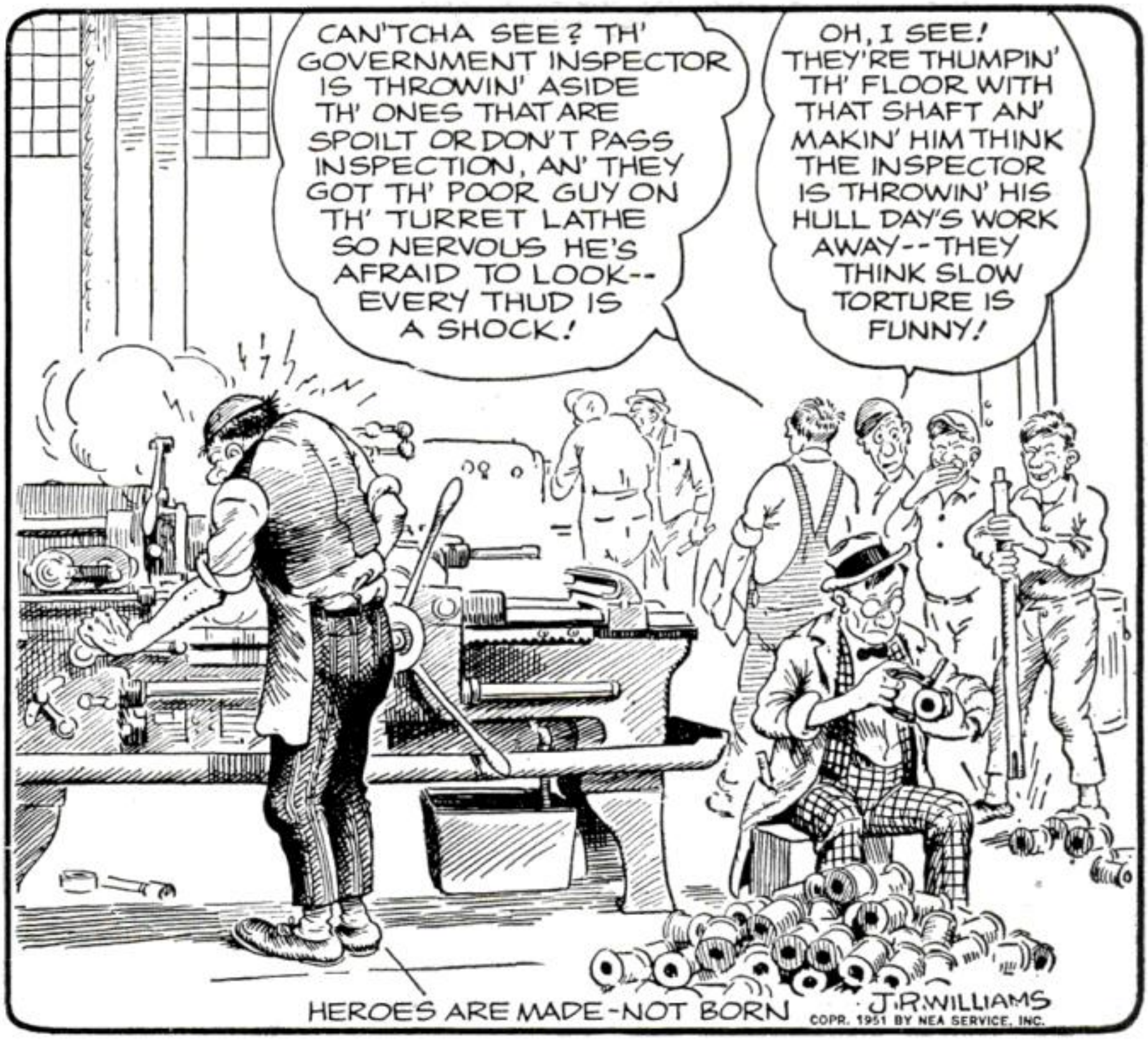
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—more than any other cartoon in the world. They have brought Williams letters of appreciation from J. Edgar Hoover, Bob Hope, William S. Knudsen and Fred Allen. He has been tagged "the Mark Twain of illustrated humor." And his pencil has made him a wealthy man.

### *He Lived His Cartoons*

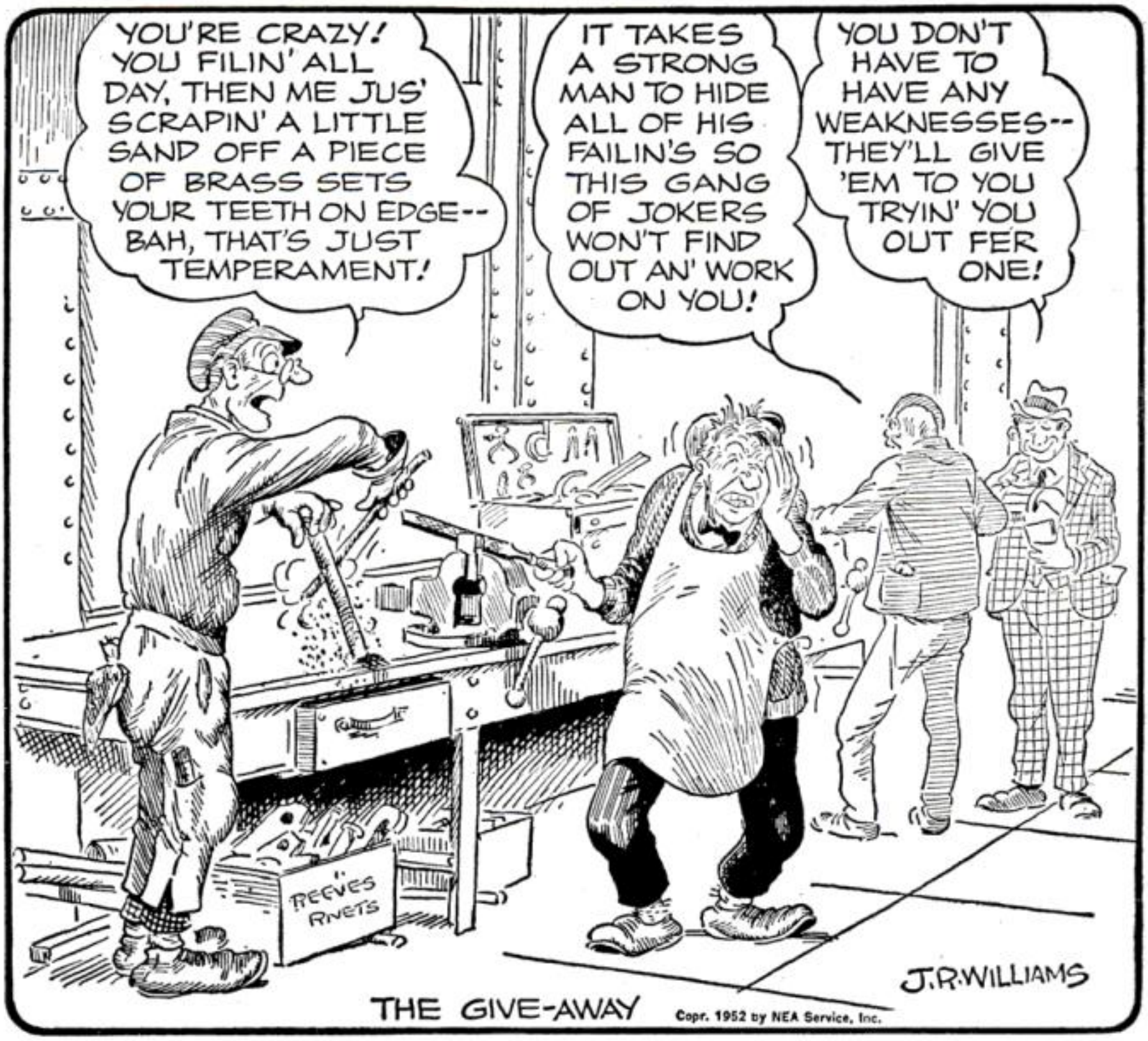
But Jim Williams has never forgotten that he started as a machinist. For about seven years, Jim worked in machine shops in Alliance, Ohio. Everybody did everything in the shops in those days, and hardly anybody did the same thing two days in a row. At the Alliance Machine Co., Jim sank dies, made patterns, even worked on a 430-ton crane that was then the largest in the world. He has hung a framed picture of that crane in his home in San Marino, Calif.—more than he has ever done with any of his cartoons.

To find a representative selection of Williams' cartoons, though, you do not have to go any farther than the bulletin board of the nearest machine shop. Shop workers have been avid collectors of his cartoons for 30 years. Jim has drawn about 2,500 shop pictures to date, and the demand for reproductions is so great that a special service has been set up to handle shop requests for "Out Our Way" calendars and blotters. And men in the mechanical trades have nicknamed just about every shop foreman in the business after the flap-footed, baggy-pantsed, beer-bellied "Bull of the Woods" in the cartoons.

The Bull was modeled after Jim Williams' foreman at Alliance. He used to stalk through the shop, head down, hands locked behind his back, with a magnificent scowl on his homely face. In those days, belt drives were standard equipment and the thousands of belts running down from the ceiling made a shop look like a forest. The Bull got his name one day when Jim Wil-



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liams was standing idly at his machine (dreaming, probably, or maybe even drawing) and the foreman suddenly charged out from the mass of belts, looking like a bull coming through the woods.

### *20,000,000 Chuckles a Day*

Shop life isn't the only string to Jim Williams' bow. He also keeps a cartoon series going on cowboys, as well as several variations on the general theme of family life, labeled "Why Mothers Get Gray," "Born Thirty Years Too Soon," and "Heroes Are Made, Not Born." Among them, they attract some 20,000,000 readers.

Williams has acquired this vast and loyal following by dealing with familiar, everyday happenings. The chuckle-a-day that he produces comes from situations close to his readers' own experience. His characters look, talk and act like human beings. His cowboys are not fancy-dressing, guitar-strumming, six-shooting heroes; they're simple, easygoing hard-working men. His shop workers are not automatons in white smocks on a production line; they're individuals in grimy overalls.

Jim was born in Nova Scotia and grew up in Detroit. At 14 he went to Mt. Union College, where he played on the football team and studied art—without much enthusiasm. He quit school after a year and took a job as a fireman on the Pennsy until he had enough money to head west. In Kansas he became a mule-skinner. In Arizona and New Mexico he worked as a ranch hand and camp cook. In Oklahoma he enlisted in the cavalry and became light-heavyweight champion of his outfit.

After his enlistment was up, Williams was married and went to work as a railroad baggage-smasher in Chicago. This hardly kept the bride and groom in coffee and cakes, so Jim became a professional prize-fighter. He was doing all right as a ham-

[*Continued on page 246*]

# "Little Black Box" Now Catches Speeders

***Radar watches Connecticut roads for traffic violators, but that is only one of the highway jobs it is doing.***

**By Wesley S. Griswold**

ON CONNECTICUT'S Merritt Parkway a few weeks ago a motorist was blithely zipping along at 70 miles an hour in a 55-mile-an-hour zone. He knew he was speeding, but he had a relaxed feeling about it: frequent glances at the rear-view mirror had convinced him that no patrol car was trailing him. It was a bitter surprise, therefore, when a state trooper suddenly stepped out and waved him to a stop.

"What's your hurry, Mister?"

The driver blamed a sheepish passenger in the back seat, who, he explained, had forgotten his false teeth. They had had to go back for them, and were hurrying to get to work on time.

### *They Always Wonder*

The excuse was most unusual but the driver's next remark wasn't. "Say, what makes you so sure I was speeding?"

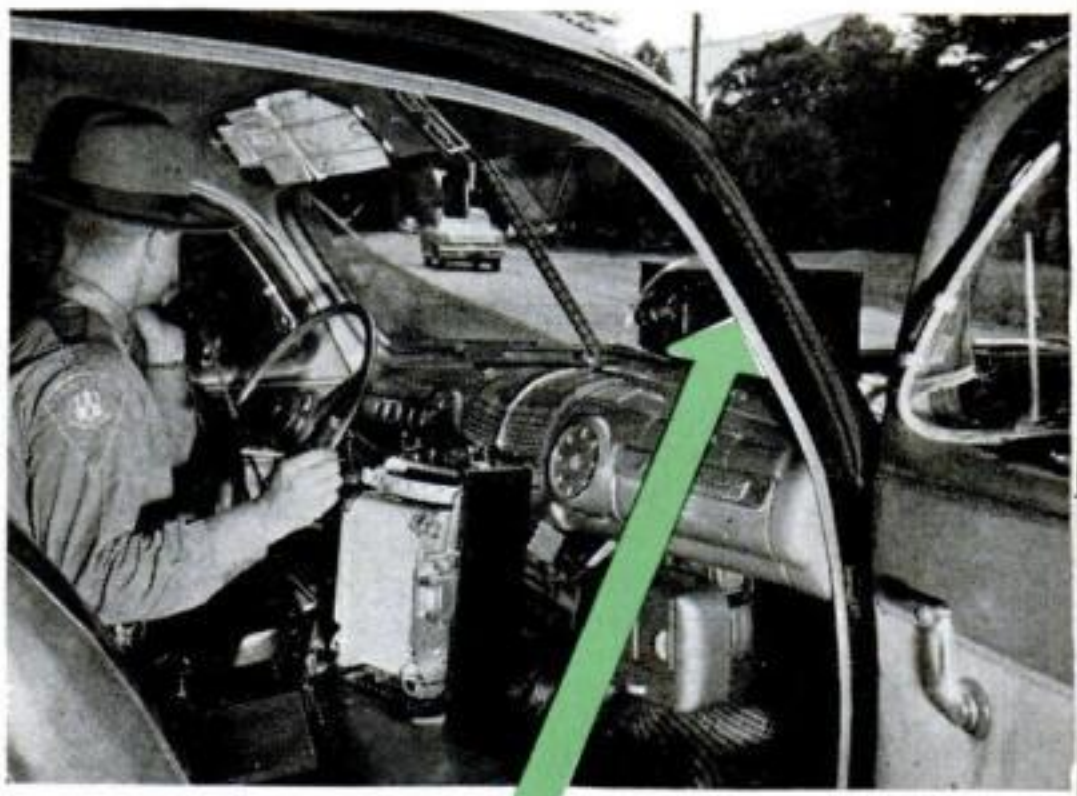
"Radar," the trooper grinned. "We've got a little black box back up the road a bit that caught you at it."

Despite their avowed hurry, the driver and his friend wanted to be shown. The trooper drove them back 1,000 yards. There, parked inconspicuously under the trees, stood another police car, a trooper behind the wheel. On the left front fender rested a plastic-faced black metal box.

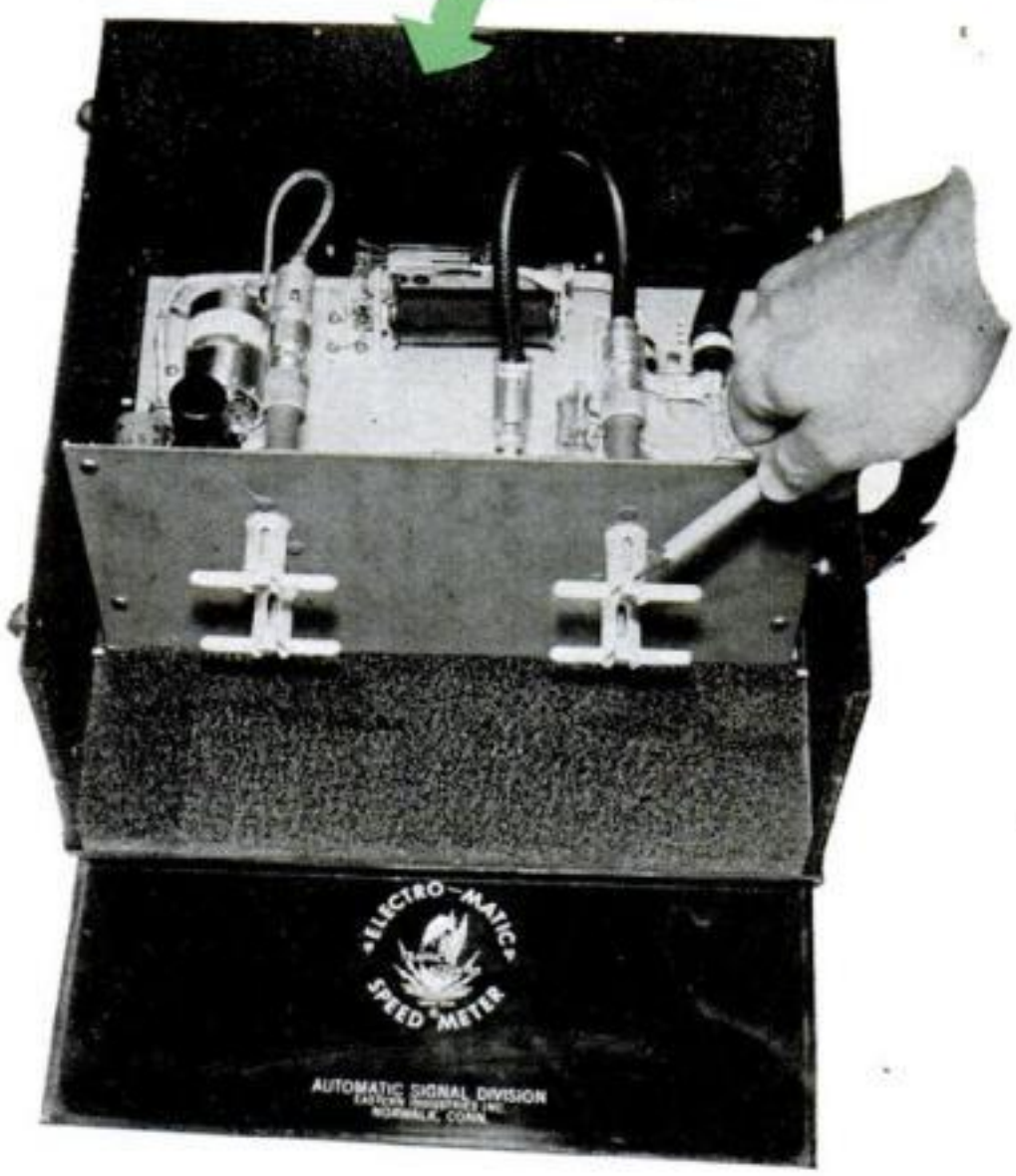
"That's what nabbed you," the trooper told the speeder, pointing to the box on the fender. "It told me how fast you were going. I took down your license number and called Al, here, on my short-wave radio and told him to stop you. It was that simple."

Two of these "little black boxes" and assisting policemen have caught nearly 3,000 speeders in Connecticut since 1948. About 450 have been arrested and penalized.

[*Continued on page 280*]



**1 DETECTED at 150 feet by the radar transmitter-receiver, and his speed recorded, a law-breaking driver heads for trouble. Below: Pencil points to radar transmitting antenna.**

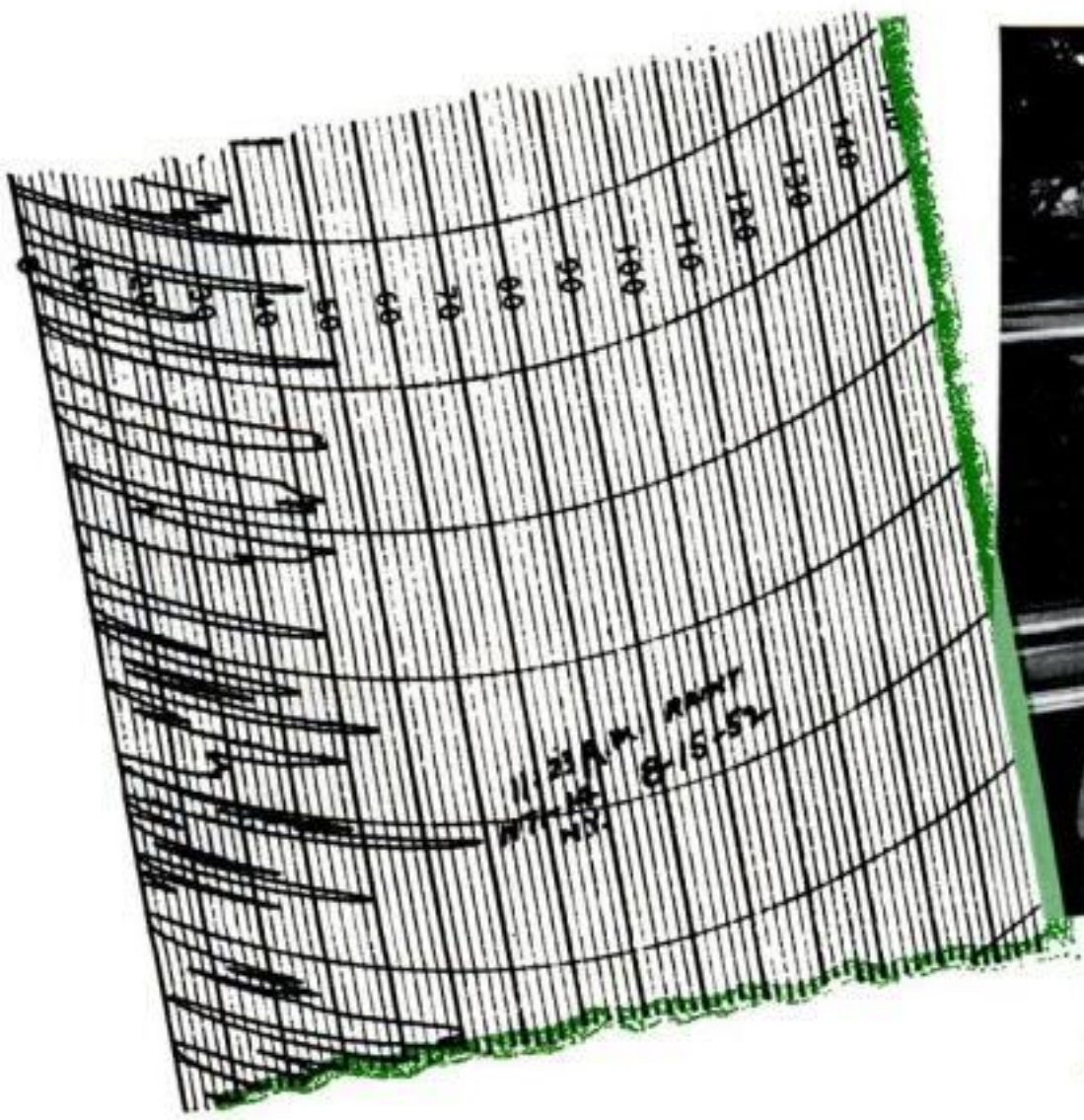





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**2 CAUGHT** a mile down the road by another state trooper, who was tipped off by the first one by short-wave radio, the surprised driver hands over his license. Earlier he had flashed past a road sign similar to the one at right, which, if heeded, would have kept him out of trouble. Connecticut always gives drivers fair warning of a radar speed check.





**3 THE EVIDENCE** against the offending driver is shown to him by state troopers, one indicating the graph (left) made by the radar set, which runs on an auxiliary car battery.



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# Magicians Scoff

***An illustrious master of the art of illusion believes that our imaginations have been working overtime ever since the A-bomb showed us what science can do.***

**By John Mulholland**

AFTER dealing with optical illusion for close to 40 years, I have become downright suspicious of purely visual evidence, especially when it concerns any unfamiliar object. And that goes double for flying saucers.

Any trained magician, you will find, will agree with me.

A magician achieves his effects not because the hand is quicker than the eye—it isn't—but because the eye is easily tricked into seeing what it expects to see, what the mind tells it to see.

Magic is a maze into which the magician lures his audience. He adds extraneous details to clutter and confuse their minds. Then he leads them, by misdirection, to take the wrong turn. For it is not only our eyes that play tricks on us. Memory, too, leads us astray.

Again and again, after one of my shows, members of the audience have come backstage to compliment me on a trick I did not do. Sometimes the trick they describe combines a part of one trick with a part of another, adding up to a feat no magician has ever accomplished.

I have followed avidly the amazing accounts of "green fireballs," "brilliant orange-red disks," and "glowing white lights" sometimes standing still, sometimes traveling over our heads at supersonic speeds. In most cases there is no doubt about the integrity of the men who report such phenomena; but how widely they differ on what they have seen and in their attempts to explain it!

**John Mulholland's** exhibitions of magic in more than 50 countries have mystified millions. He is a member of the chief magic societies in America, honorary vice-president of the Magic Circle in England, honorary life member of the Magicians' Club of India, author of *The Art of Illusion* and other books. In this article, this celebrated deceiver of delighted audiences gives his frank opinions on flying saucers.

### *The Venusians Are Coming*

Some say the saucers have been weather balloons. Others suspect they are secret weapons. And a group called Borderland Sciences Research Associates of San Diego, Calif., states unequivocally that: "Most of the disk-shaped craft come from the etheric regions of Venus . . ."

I cannot actually disprove these or any of the other ingenious theories that have been advanced. *But they cannot all be true.*

Hallucinations are commoner than you may think. An inquiry conducted by the Society for Psychical Research revealed that more than 10 percent of the people polled had experienced at least one hallucination while they believed themselves to be fully awake and in normal health. "These hallucinations," the report added, "are more frequently visual than auditory." You have probably noticed that most flying saucers are oddly silent—few saucer spotters seem to hear any noise.

In everyday life, as in magic, our minds are constantly interpreting what we see. Some years ago, as a publicity gag, a jewelry store displayed in its window a gigantic "diamond" solitaire. It was as phony as Junior's pearl-handled shooting irons, yet thousands stopped to admire it before a jewel expert happened by and spotted the hoax. All the others had seen what they expected to see.

Let me give you an example of another kind of illusion: A friend of mine was driving alone through rural Vermont on a dark,



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# at Flying Saucers



Please turn the page the instant you see this picture . . .



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# How many saucers are in the picture on the preceding page?

**If you counted right at a glance, your eyes are sharper than average. But can you say how big they are? And how far away? (They range from five inches to a foot in diameter, and none of the saucers is more than eight feet from Mulholland's right hand.) This is an unretouched PSM photo showing John Mulholland making actual saucers "fly." How did he do it? A magician never tells.**

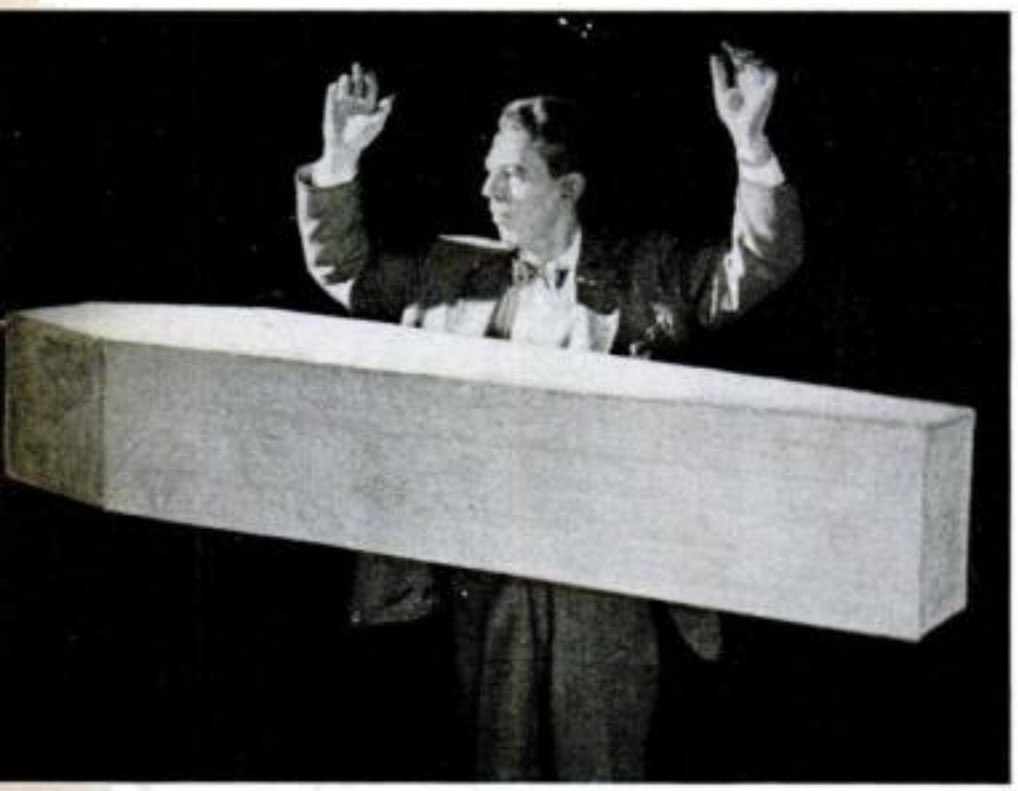
rainy night, when his car broke down. He found shelter in an isolated farmhouse. His host showed him to a bedroom lighted only by a kerosene lamp. My friend, an inveterate reader-in-bed, found a discarded shoe box in the closet, tore a hole in the top, placed it over the lamp chimney as a shade, and settled down to read.

When, at last, he put his book aside and turned off the lamp, he sat up with a start of horror. Floating over the bed, bathed in a weird bluish light, its outline unmistakable, was a coffin. For a time he lay there too scared to move. Then he said to himself sternly, "John (meaning me) claims there is a rational explanation for everything." And he got up to investigate.

His spine soon defrosted. The lamp was not quite out. With the wick turned way down, the tiny blue light remaining threw on the ceiling the apparition of the coffin—roughly the shape of the hole in the improvised lamp shade. The rest was imagination.

Ever since Hiroshima, we have all suffered from the jitters of the Atomic Age. Our imagination has been working overtime. And—"imagination is the mother of superstition." What! Do I think then that flying saucers are only a Twentieth Century superstition? Yes, I do. A superstition peculiarly suited to the times we live in. I believe there have always been unexplainable phenomena occurring in this world of ours—unexplainable because of our imperfect understanding of natural laws.

In less scientific ages, people believed in and *saw* fairies and elves, dragons, mermaids, vampires, werewolves, leprechauns, ghosts. Scores of sailors have sworn they saw that spectral ship, the *Flying Dutchman,* off the Cape of Good Hope. And remember the tales of the Loch Ness monster?



**FLOATING COFFIN TRICK—one of Mulholland's famous feats of levitation—was inspired by the legend that the coffin of Mohammed rests suspended halfway between heaven and earth.**

### *More Stories, More Saucers*

Whatever the saucers are—mirages, meteors, lights reflected from the earth, or what not—they have probably been around for a long time. But in this era of instantaneous communication, what would once have been isolated, or unheard-of, incidents are now gathered overnight into an imposing mountain of evidence. And the more saucer stories fly around, the more people are going to be stimulated to see and report similar phenomena.

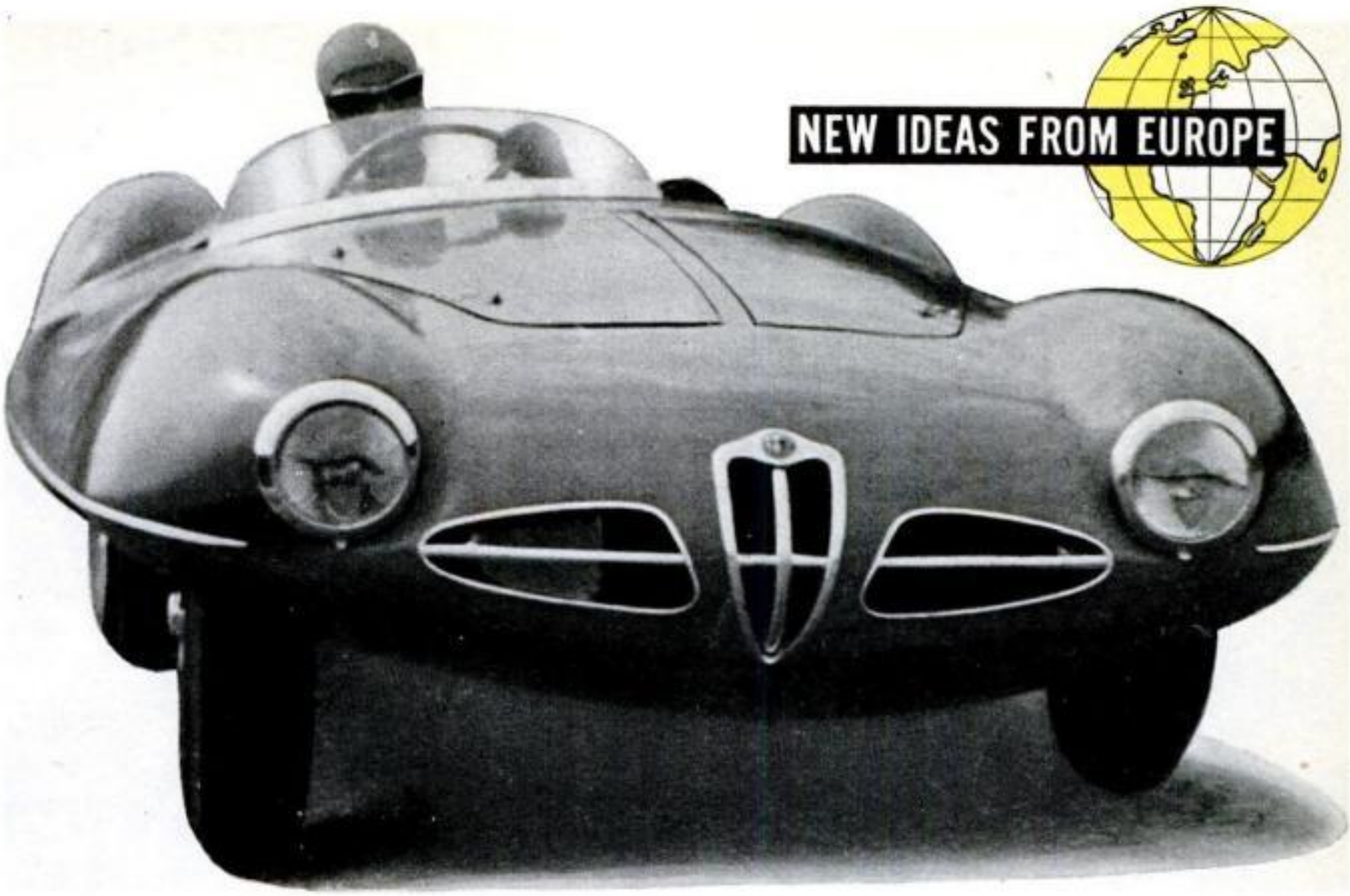
I could be wrong 100 per cent. Maybe next week a saucer will land on the earth and be put on exhibition where we can see it, touch it, examine it. Until then I shall go right on thinking that flying saucers are a state of mind—for four decades of magic have taught me that honest, intelligent, alert men and women can, by suggestion, quite readily be made to see things which aren't.

END

***Now turn to p. 167, where Kenneth Swezey will show you how to create saucer-like illusions.***



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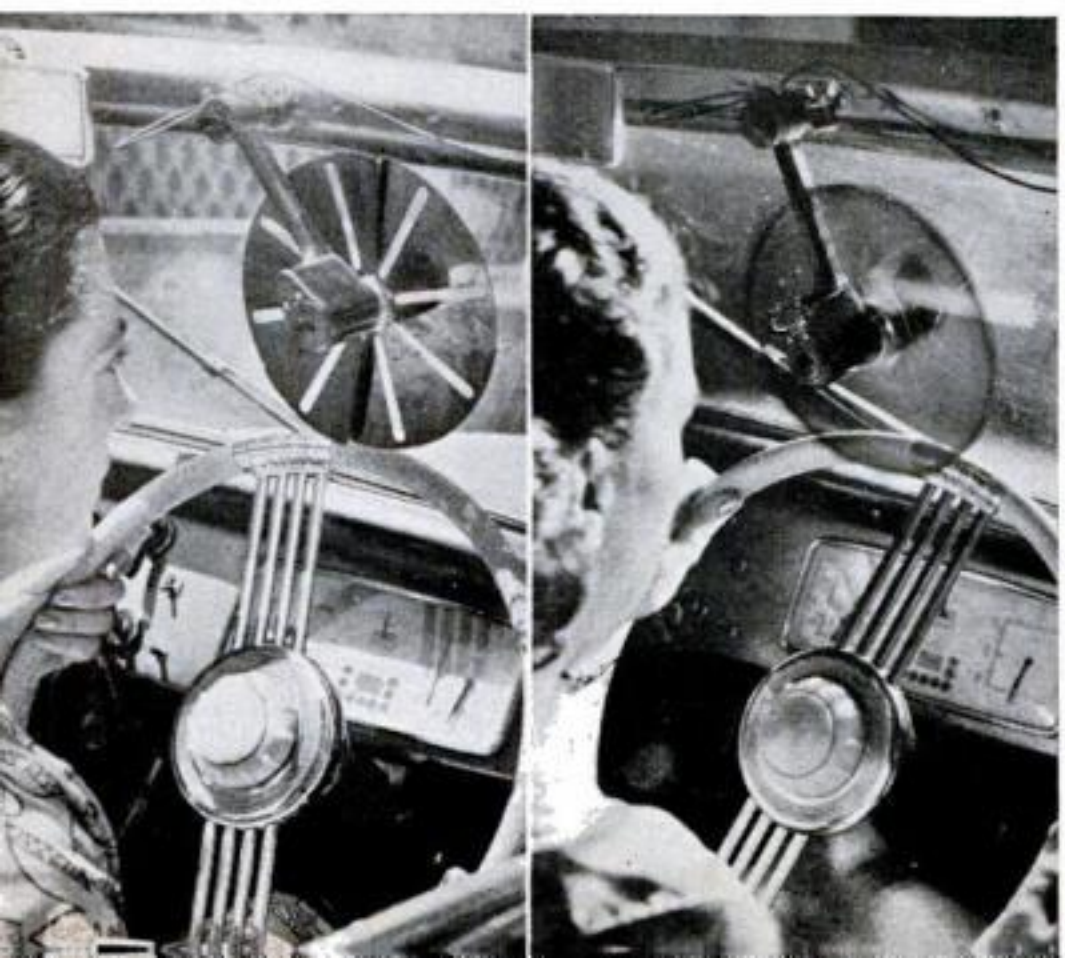



## Alfa Romeo's New "Flying Disk" Knocks Off 155 M.P.H.

Now under test at the Alfa Romeo factory in Milan, Italy, the striking new 155-m.p.h. sports job above will be ready to make its bid for supremacy in the international racing field next year. Known as the "Flying Disk" because of its flat, rounded streamlining, the new Alfa's six-cylinder engine, with three dual carburetors, puts out 200 horsepower with a piston displacement of only 2,995 cc. (about 180 cubic inches).

## "Pie Plate" Spins Out Glare

THIS rapidly rotating device interrupts driver's vision just long enough, says Italian inventor Santino Alassio, to cut glare from headlights or sun, yet permit a clear view of the road ahead. Made of opaque plastic divided into eight slotted sections, it is powered by a tiny electric motor.



## Three-Wheel Scooter Is Safer

A MOTORIZED tricycle shown at a recent Munich, Germany, exhibition of vehicles for invalids, offers the added stability of two front wheels. Although designed primarily for the handicapped, it will also serve any scooter rooter who prefers to keep three wheels on the ground instead of two.



# Will Railroads Use Wheelbarrow Coaches?




**C&O says that this is the train of tomorrow and backs its claim with a million-dollar model.**



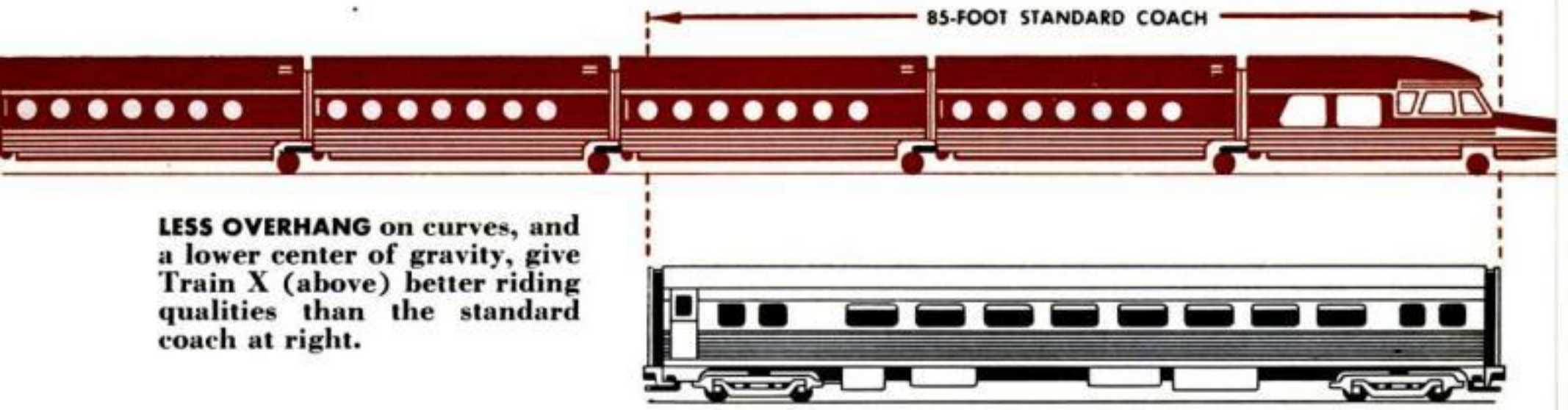
**COUPLER SHAFT** also provides a bearing surface for front of the car. All connections are automatic, reducing coupling time.



**BRAKE** presses against face of rubber-centered wheel. Axle is sprung to provide a pendulum motion for the car on curves.



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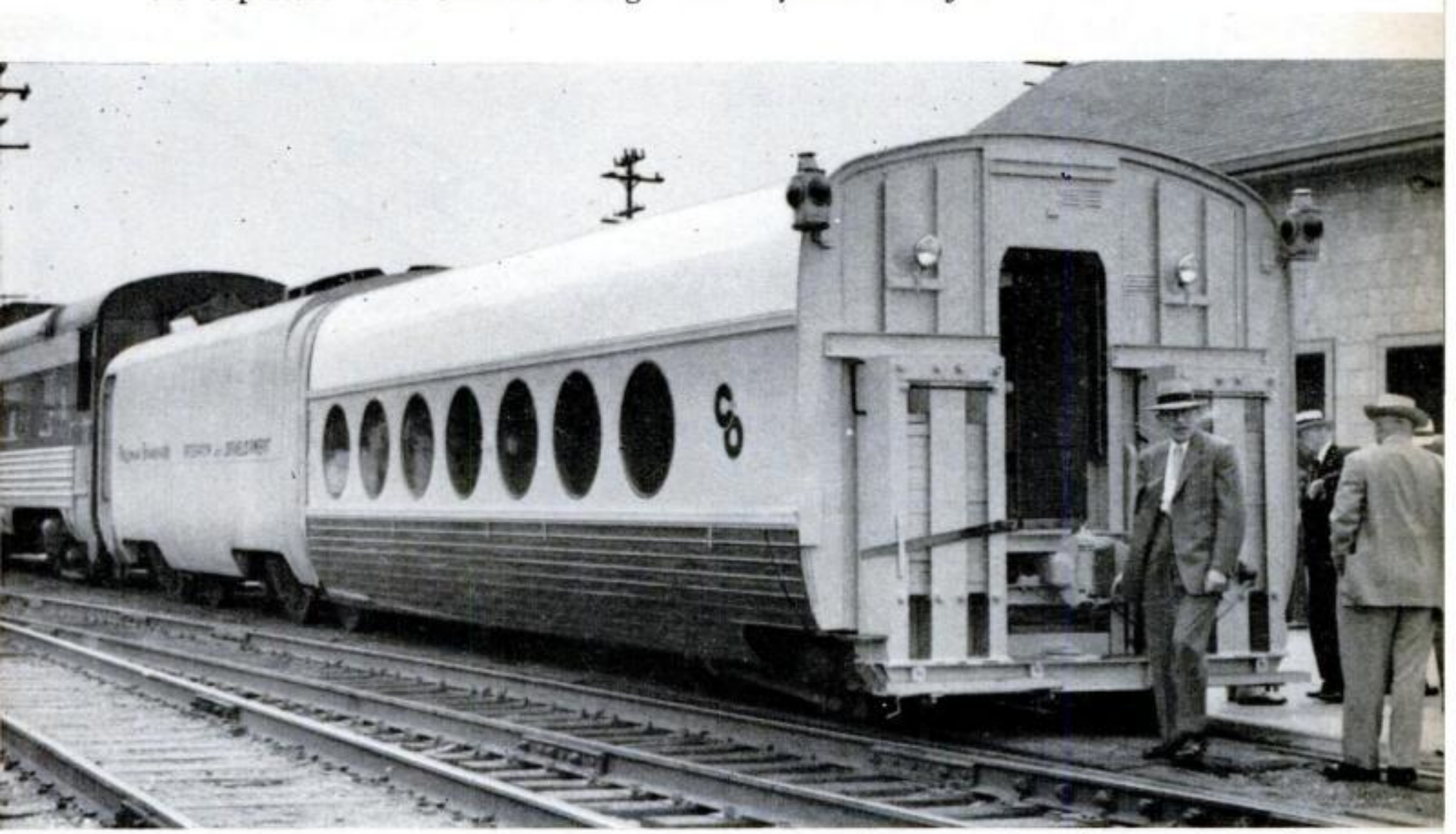

**LESS OVERHANG** on curves, and a lower center of gravity, give Train X (above) better riding qualities than the standard coach at right.

***One-axle car pioneered by Chesapeake & Ohio will hug the rails at 140 miles an hour.***

A PASSENGER train made up of wheelbarrow-like coaches, each riding on a single pair of wheels placed at the rear, and supported up front by a massive coupler connection to the car ahead, is well past the blueprint stage on the Chesapeake & Ohio Railroad.

The first of the "Train X" coach units, now undergoing road tests, is the most radical departure from standard design ever made by an American railroad. Only 10 feet high and 31 feet long—conventional coaches are three feet higher and measure 85 feet between couplers—the test car has unusually smooth riding qualities. C&O engineers predict that its trailing action will make 140-m.p.h. operating speeds practical and safe.

They also point out that flyweight construction will cut both production and operating costs. Today's standard, 76-passenger coach weighs about 110,000 pounds and carries a $140,000 price tag. Three of the Train X cars, seating 84 passengers, will weigh 34,650 pounds, cost about $47,000 and pay for themselves in less than four years.—*Henry B. Comstock.*



**FIRST TRAILER COACH** needs a specially built adapter car for road tests with standard equipment. A solid string of Train X cars will have better tracking characteristics than a single unit, particularly when coupled to a locomotive of new design.



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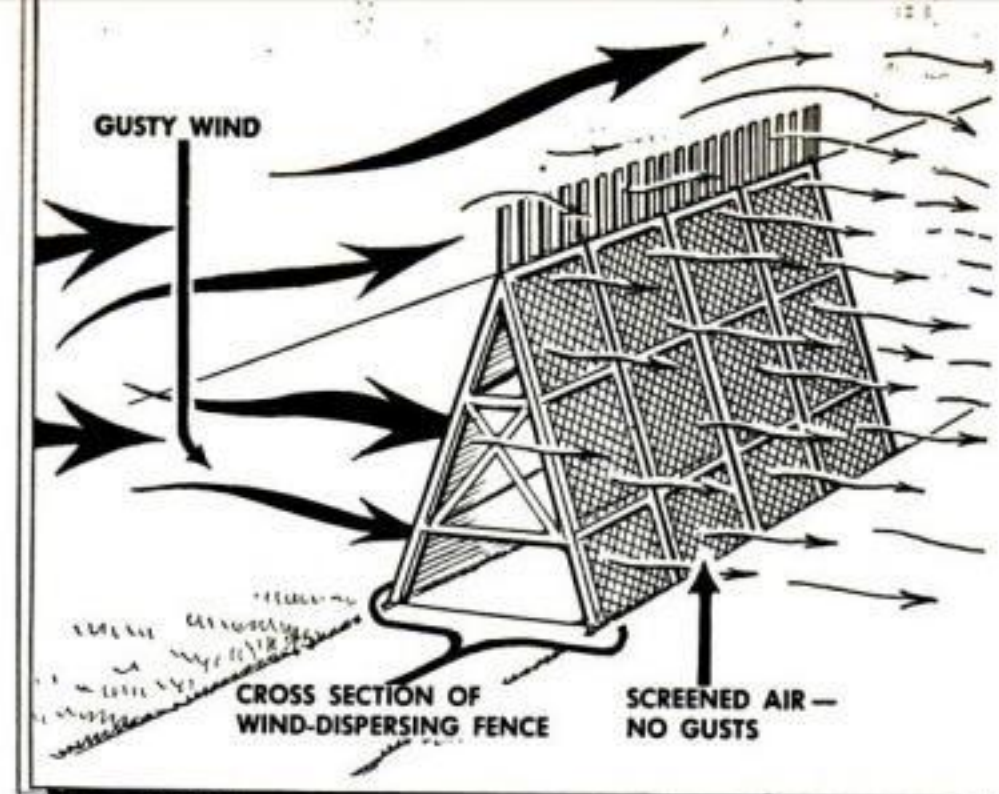
# Single Runway Proposed as an Airport

AIRPLANES have grown up fast. As they take on weight and speed, airports have had to keep pace by building longer and longer runways. That wouldn't be such a problem if only one runway were needed. But cross winds, the bugaboo of take-offs and landings, demand a crisscrossing maze of expensive concrete strips.

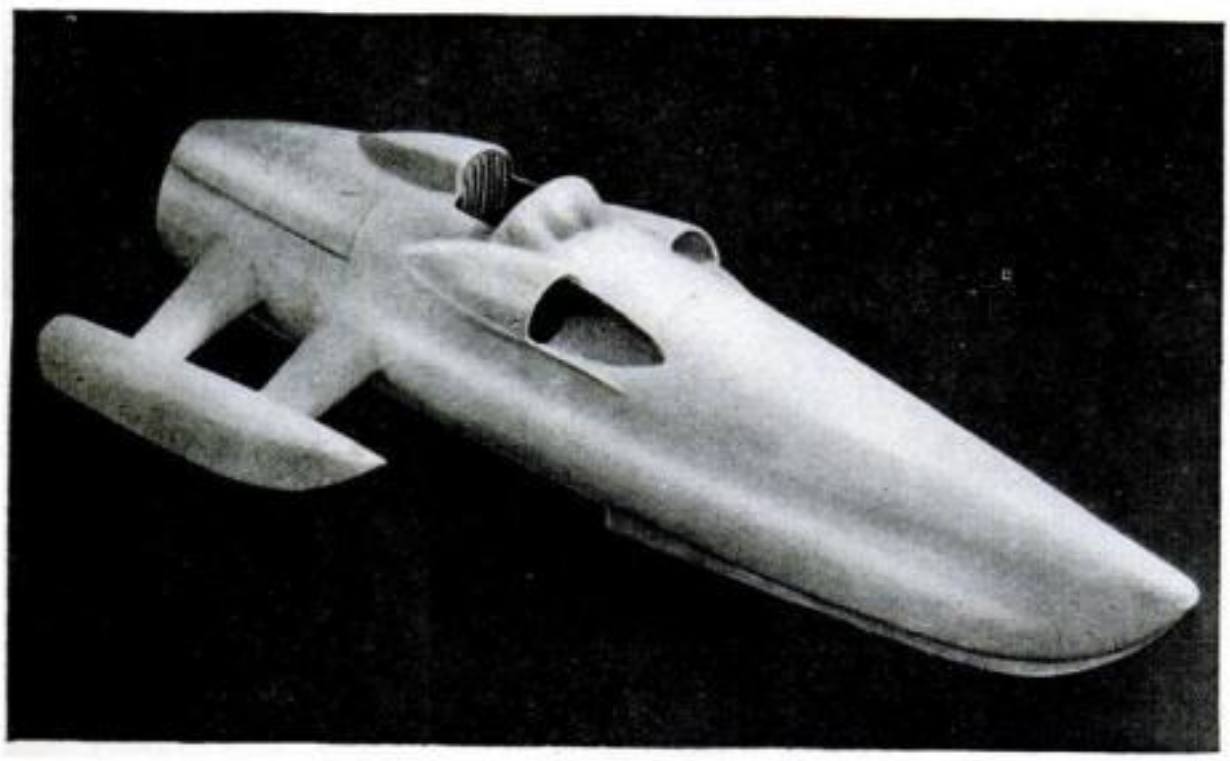
Now a solution has been suggested by aviation engineer Assen Jordanoff: the single-runway Strato-Port shown at right. Fences along both sides of the 10,000-foot runway would take care of cross winds by absorbing troublemaking gusts, as illustrated in inset at upper left of the drawing.

In the middle of the runway there would be an elevation, or bump. Planes would land toward this bump, which would slow them down as a hill slows a car. They would take off from the bump, downhill, gaining acceleration. Results: shorter runway distances for both landing and take-off; greater safety because treacherous cross winds would be practically eliminated.

Another advantage claimed by Jordanoff for his Strato-Port is that all airplanes would take off from one location—a convenience to passengers.



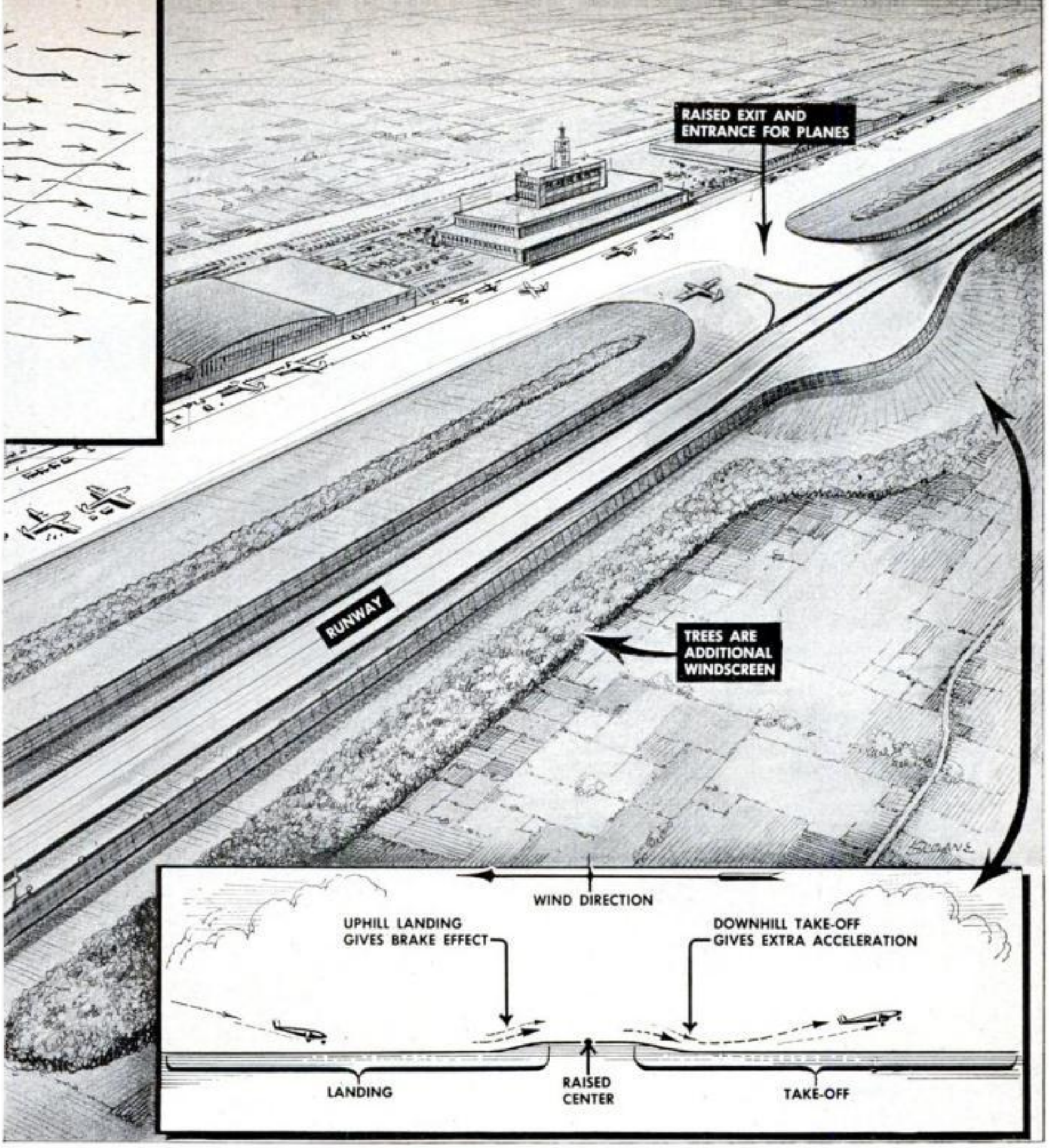

# While British Build Jet Boat,



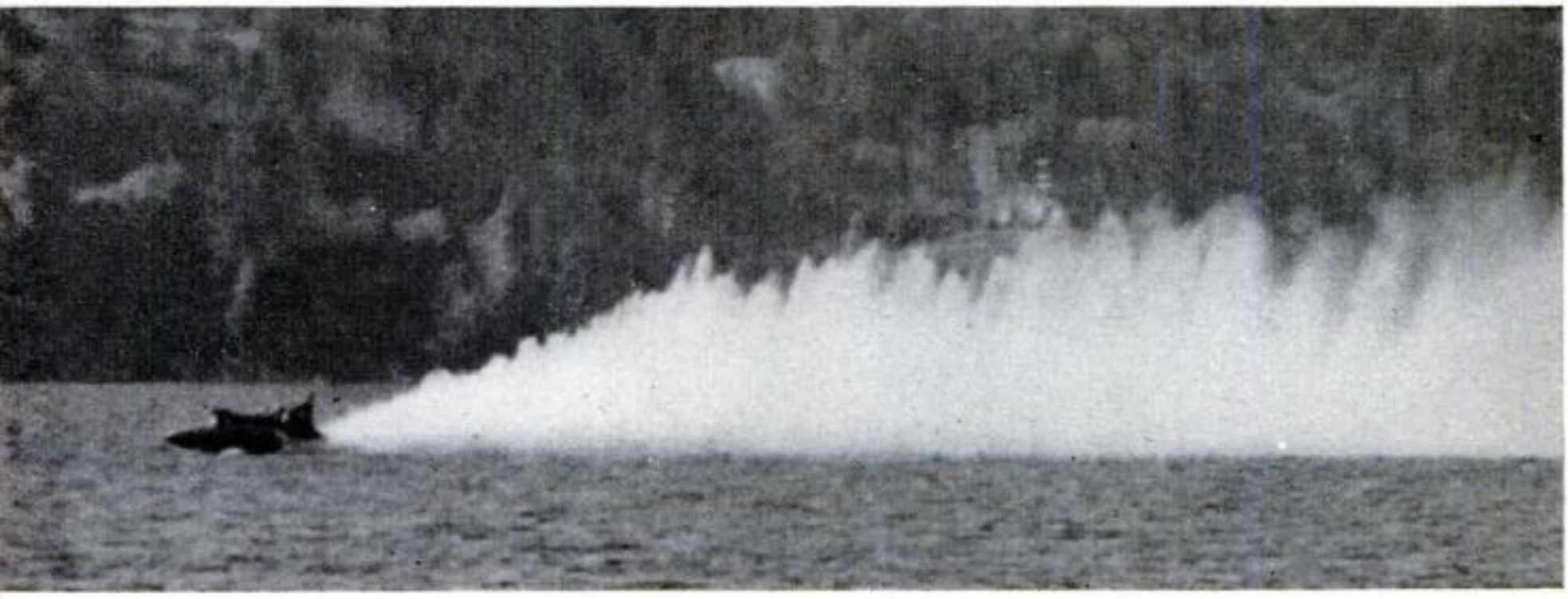
JET propulsion may put speed boats in the 200-mile-an-hour class. That is the goal of John Cobb's Crusader (model at left). Being built in England, it will be powered by a Ghost engine, the type used in the famed Comet jet airliner. Meanwhile, however, U.S. sportsman Stan Sayres stands on his propeller-powered record of 178.497 m.p.h. set recently in Seattle (right).



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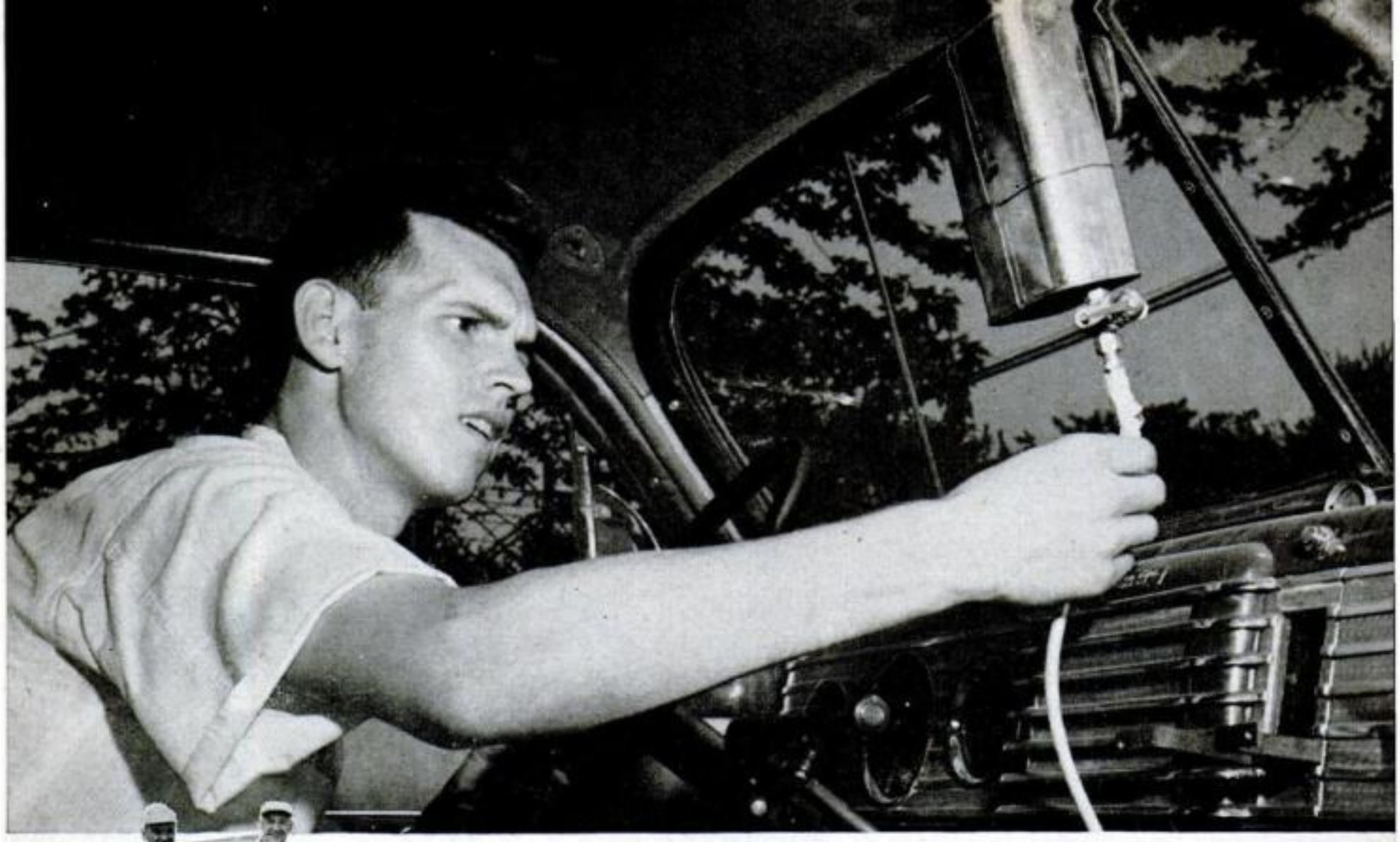


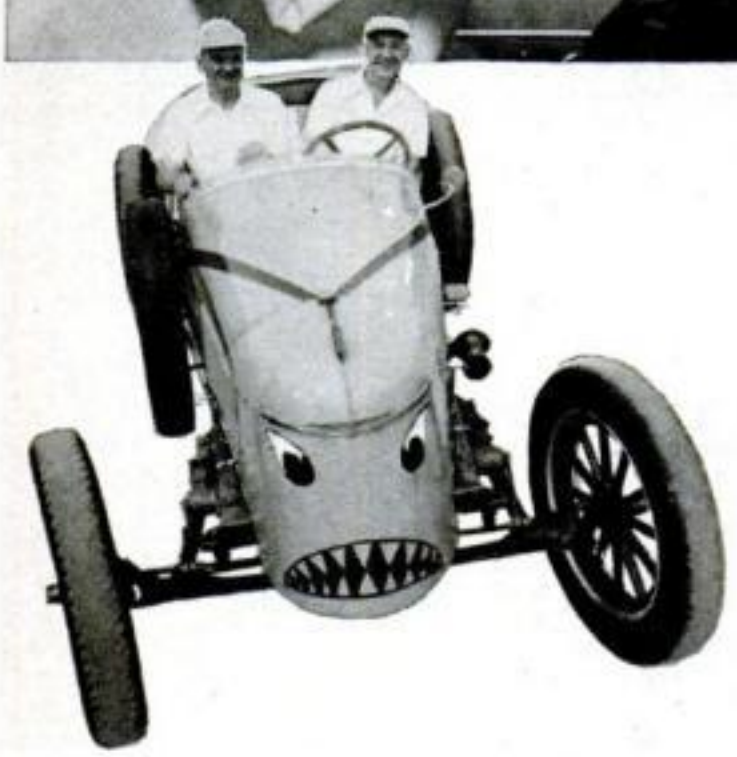

# U.S. Prop Job Sets 178-M.P.H. Record





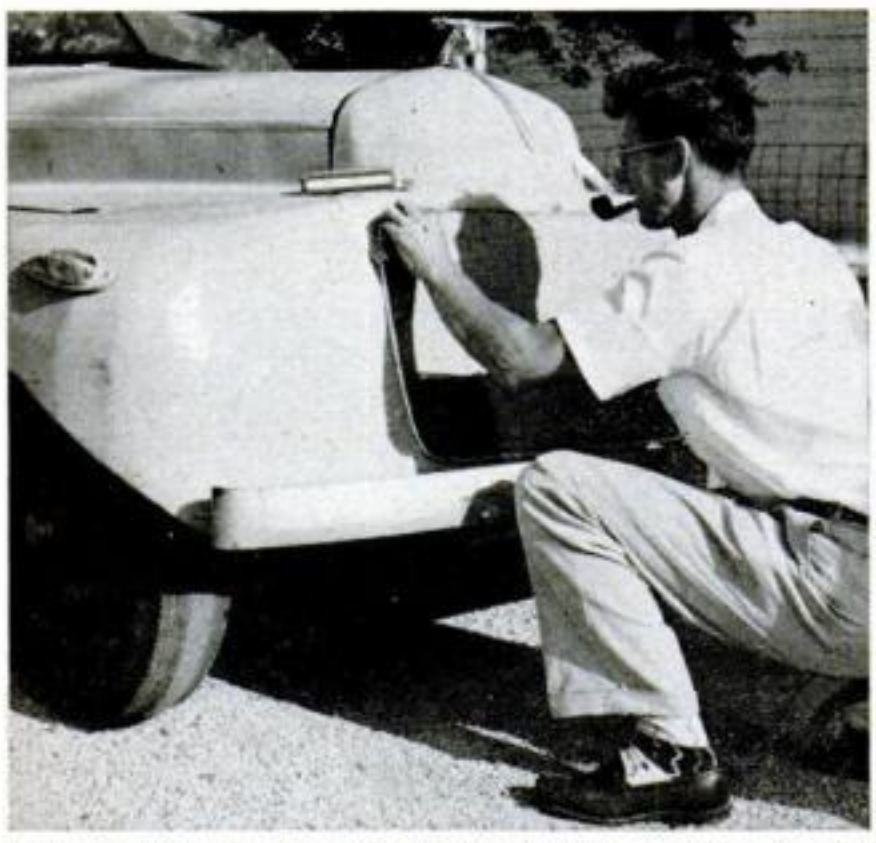
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**CONTESTANTS** in Shell "mileage marathon" get one gallon of gas in tank like this piped to carburetor. At end of run, remaining gas is weighed, mileage computed. Car with teeth (left) has won last two years.

# How to Go 168 Miles on a



**ONE WAY TO BOOST MILEAGE** is to block off radiator. Top car in 1951 and 1952 had compression ratio boosted from 4.3 to 6 to 1, 33-inch instead of 30-inch tires.

THOSE engineers in Wood River, Ill.—remember them, the fellows who go so far on a gallon of gas?—have been at it again. This time they managed to average 168.49 miles to the gallon in a 1924 Chevrolet.

These dream-world displays of efficiency have been going on, except for the war years, since 1939. They take the form of an annual contest among engineers and scientists at a Shell Oil research laboratory.

Getting eight to 10 times the normal gas mileage is really no trick. You yourself can do it—with practice. All you do is:

Plane down your cylinder head to boost your compression ratio;

Rework your gearbox and change your rear-axle ratio;

Disconnect your fan, generator and all other power-consuming accessories;

Shield your radiator to cut wind resistance;

Super-tune your ignition and carburetion;



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**"ROAD FRICTION" is reduced almost to vanishing point by contestants. This low-pressure tire, most of tread filed off, registers 100 lb. pressure, will get a few pounds more.**

# Gallon of Gas

Pump up your tires to 110 pounds and file down your tread.

Then accelerate in high to 20 m.p.h., cut your ignition, coast to five, re-start, and repeat for 12 miles. (For more practical tips on how to save gas, see page 175.)

That's all that the winners, Dave L. Berry and Fred Schutte, did. With a penalty handicap for weighing less than 3,500 pounds, their corrected figure was 146.98 miles per gallon. Their speed averaged 11 m.p.h.

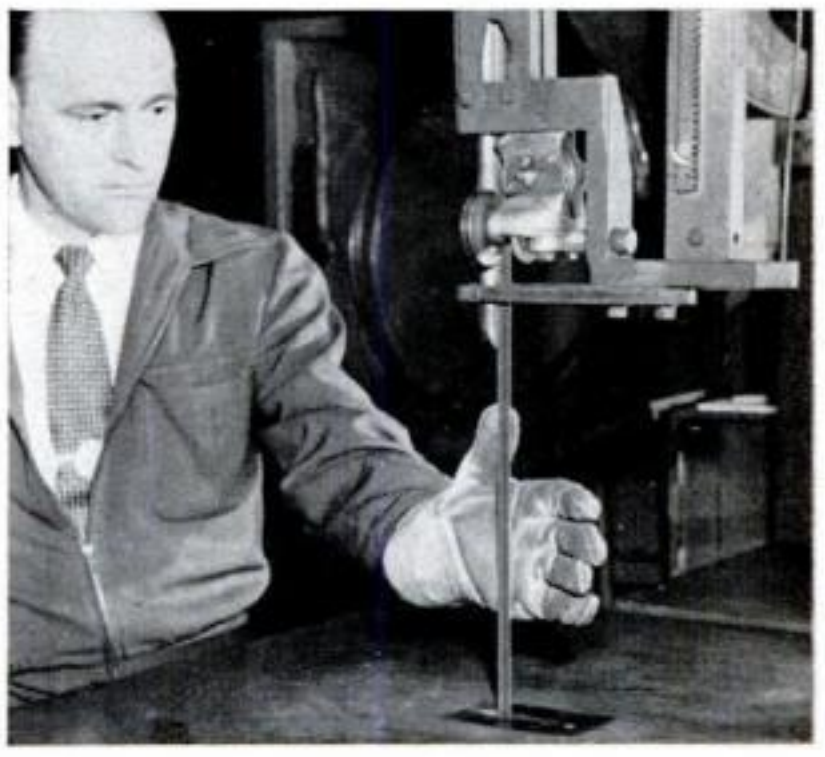
The same team won last year with far lower mileage, because of a rougher course. The all-time corrected high—149.95 miles per gallon—was set by Dr. R. J. Greenshields, in 1949 with a '47 Studebaker.

This year there was a new class for drivers with "less than professional instincts,"—a nice way to describe rank amateurs—who had to average 30 m.p.h. It was won by a Nash Rambler at 64.48 m. p. g. END



## Airport Radar Gets TV Assist

TELEVISION tricks are put to work in this new radar for airports. The big viewing screen is a standard 30-inch TV picture tube. On it technicians see pips representing nearby planes superimposed on a detailed map of the airport. This is not a radar map but an electronic enlargement of a drawing that shows all the details, including structures, mountains and other obstacles. The map is fed to the screen from a small glass slide by a flying-spot scanner, much the way TV commercials are fed to home receivers from a broadcasting station. The system was developed by Du Mont in collaboration with the CAA.



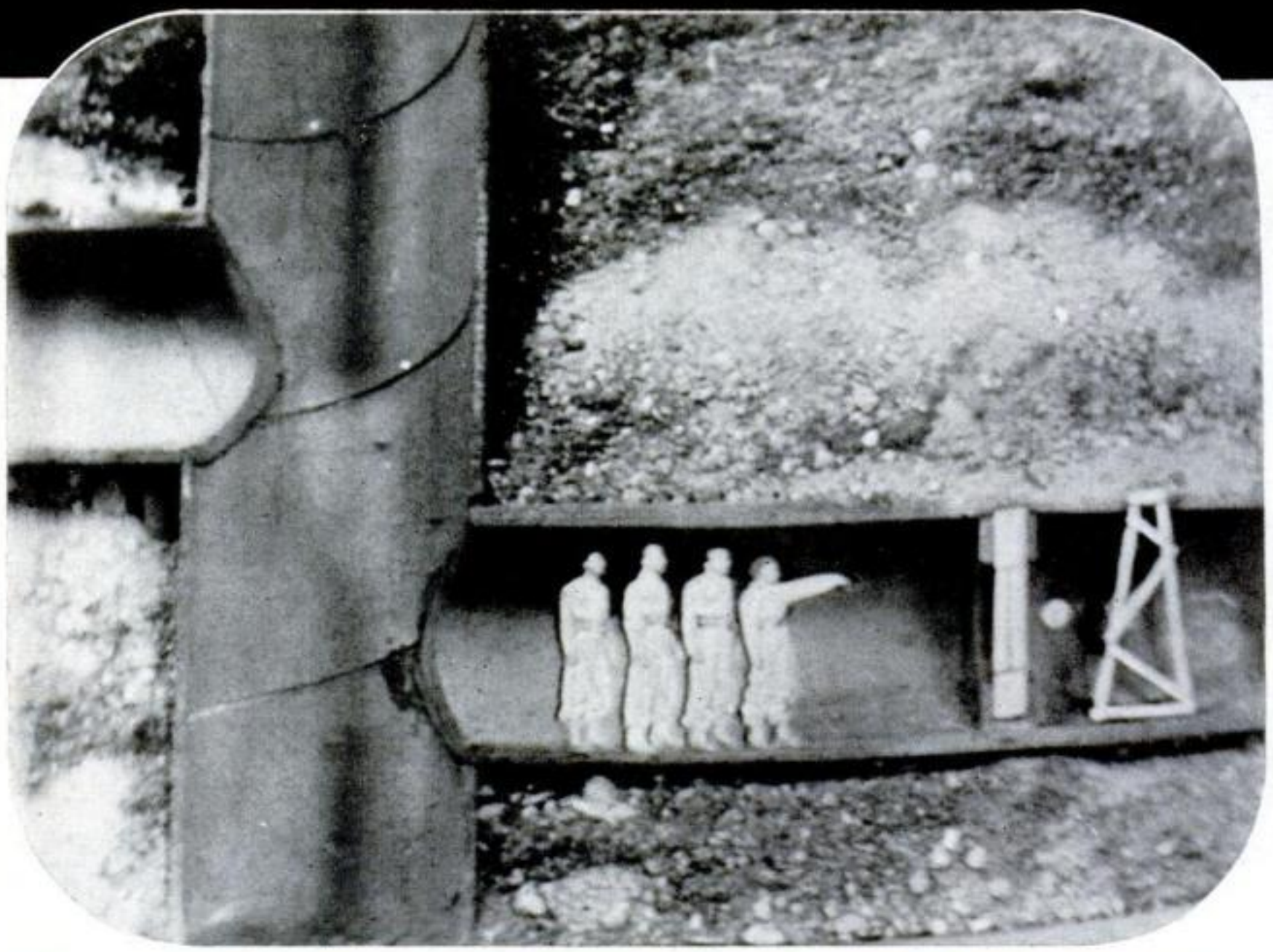
## Box Straps Make Saw Blades

TRYING to reduce his company's bills for bandsaw blades, Jack Prince, Solar Aircraft engineer, tried using ordinary steel box strapping. It bit rapidly into stainless steel and alloy sheets, lasted 10 times longer than toothed blades, cost but a dime. The strapping burns its way through by frictional heat.



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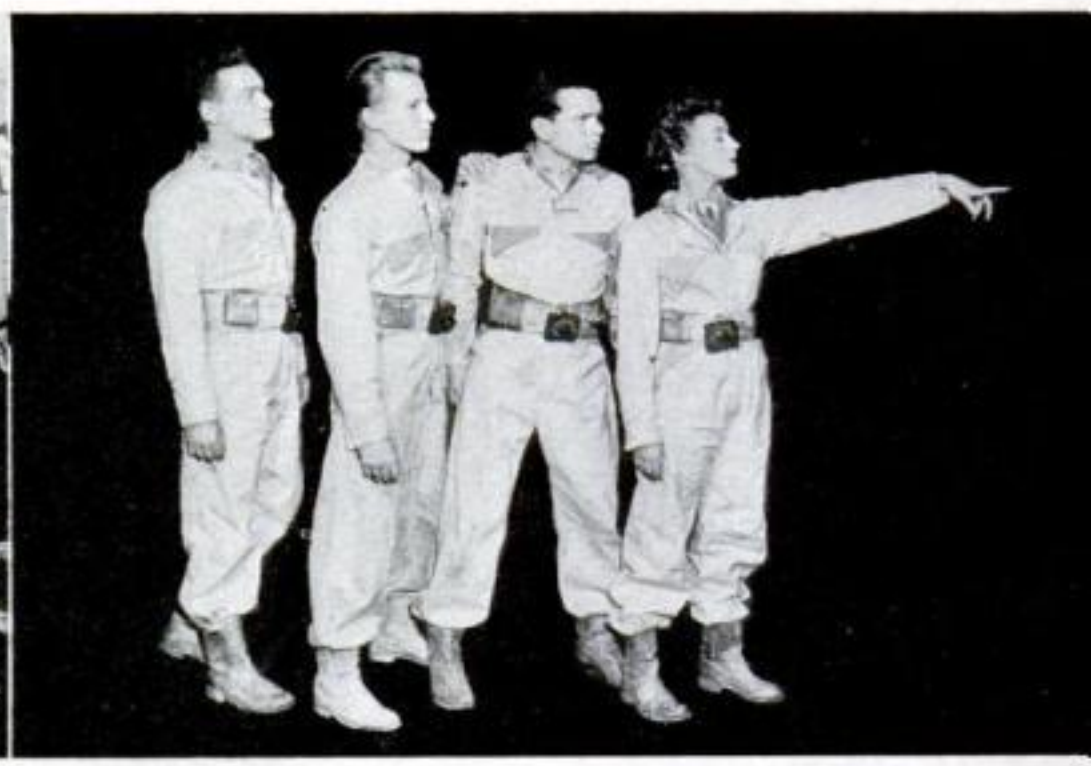
# How TV Tricks



***Actors walk in tunnel under moon. How it's done is shown below.***



**1 CUTAWAY MODEL** simulates shaft and tunnel under moon's surface. George Gould, director of *Tom Corbett, Space Cadet*, shows where actors are to appear. Camera is close.



**2 ON BLACK-DRAPED SET** actors walk in single file as they would in the tunnel. Jan Merlin, Al Markim, Frankie Thomas and Margaret Garland look like this on the set.



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# Take You Space Traveling

***Men float in space, extinct monsters live, and spaceships explode in studio-created science-fiction universes.***

SCIENCE-FICTION fans some time ago saw a tyrannosaur attack a spaceship. Over the pilot's shoulders they watched the monster claw at the ship's port, its fanged head big as a man's body. It was undeniably alive.

On the moon, a rash young space cadet jumped up carelessly. His leap sent him 20 feet off the surface, over the heads of his fellow cadets. The camera followed him as he spun about, arms windmilling, and slowly fell under the moon's feeble gravity.

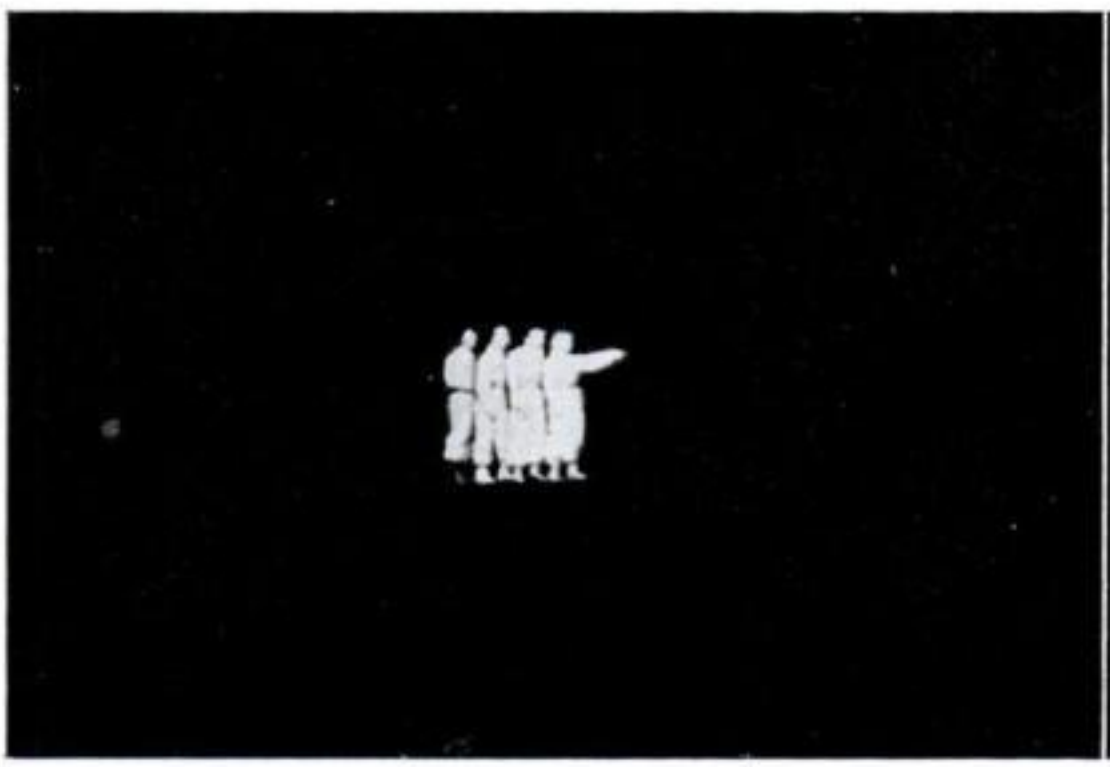
Pulling no dramatic punches, science-fiction scripts call for many such bizarre effects. But in television, the impossible just takes a little longer. Two technical tricks create most stunts: moving the image, or superimposing it.

The picture signal from a TV camera can be turned upside down by throwing a switch, tilted or rocked by tilting the camera itself, or turned at any angle by a trapezoidal prism. The prism can give anything from a slight tilt to a complete flip-over, or it can be turned around and around to make the picture spin.

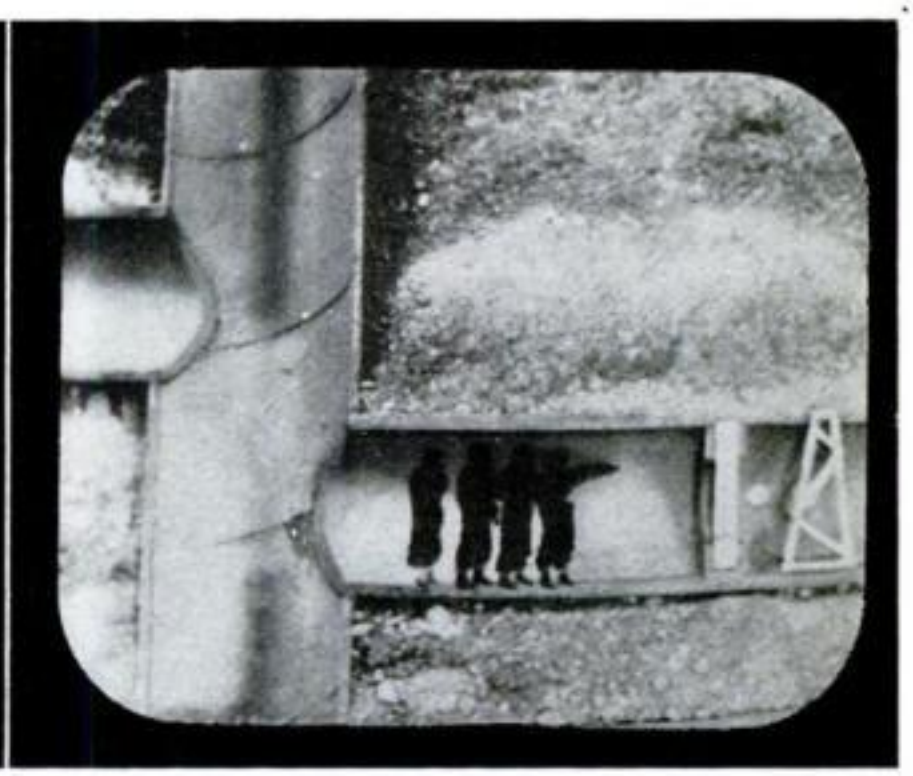
### *How Things Fall Up*

A struggle in "space" becomes simple if the actors thrash about on a black-draped set while the camerman turns the prism slowly. And if something has to fall "up," it's a cinch just to let it drop in the studio and turn the prism to show it calling Newton a liar.

To get action against a moonscape or other scene usually requires two cameras. The images then are blended into one. Blending camera images is an old dodge, just the thing for creating ghosts such as



**3 CAMERA IS SPOTTED to pick up image of actors small enough to fit into the tunnel, like this. Picture is electronically impressed on that from the first camera . . .**



**4 . . . TO BLANK OUT its own size and shape in the tunnel. "Hole" moves as the actors do. Turning a control fills blanked-out area with detail as in middle of the facing page.**



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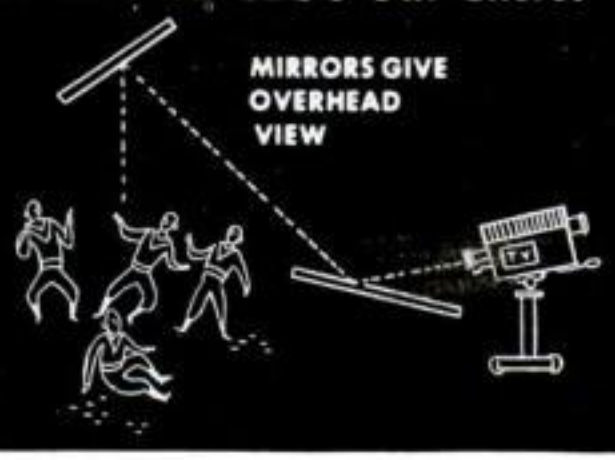

**CREWMAN MAKING REPAIRS** on space ship loses his hold and drifts up into space. Actually, prop hull is hung from ceiling, and man drops to floor as a prism turns scene upside down.




**ANTIGRAVITY FLIGHT** was shown by rolling black-draped dolly, with actor face up on it, under trees hung upside down from ceiling. A prism turned the picture over.




**INSIDE AN ASTEROID,** men are pinned to walls as it spins out of control. They simulate action while a motor-driven prism on camera spins the picture. The three stunts above were on CBS's *Out There.*




Scrooge in *A Christmas Carol.* You expect to see the furniture through him. But it would spoil the illusion of the flying cadet if the moonscape showed through him.

It doesn't, thanks to an electronic rig in the control room. Technically a discriminator amplifier, it is called the Gizmo by the studio staff that puts on *Tom Corbett, Space Cadet.* Their version was developed by George Gould, director, and David Fee and Rolf Drucker, ABC engineers.

### *Gizmo Makes Men Fly*

The Gizmo can pick up the picture of an actor on a black-draped set from one camera, and insert it in a picture of a moonscape set with other actors, picked up by a second camera. The first actor jumps, the camera dips (making him go up), and the prism is turned to spin his image around while he flails his arms about. In the blended picture, he seems to take off before the astonished eyes of his friends.

When the script called for a jungle setting, one camera focused close up on a jungle photo that showed a clearing in the foreground. The actors worked on a black-draped set, and the Gizmo blended the images. Wherever the actors walked, the "jungle" behind was blocked out solidly.

Moving the camera in or out can create the illusion of size from small props. In a chase across boiling mud flats of a primeval world, the actors leaped on prop rocks on a black floor. A close-up of a panful of boiling breakfast cereal, blended in by the Gizmo, furnished the terrifying natural setting—with plenty of steam and action.

### *Tyrannosaurs Live on TV*

Look over Tom Corbett's shoulder as he takes his spaceship in for a lunar landing. The moon grows larger and larger in the view port over the control panel, craters and fissures stand out clearly as the ship comes in, tilt as it banks on turns.

This could be a moving-picture film of the lunar landscape on a screen behind the port. But filming takes time and money. With the Gizmo, one camera can pan in on a model lunar landscape. The other, behind Tom Corbett, takes in the view port but sees only a black drape through it. The Gizmo blends the two. You see the moon through the open portions of the port.

Tyrannosaurus Rex, in the terrifying scene of the attack on the ship, was noth-

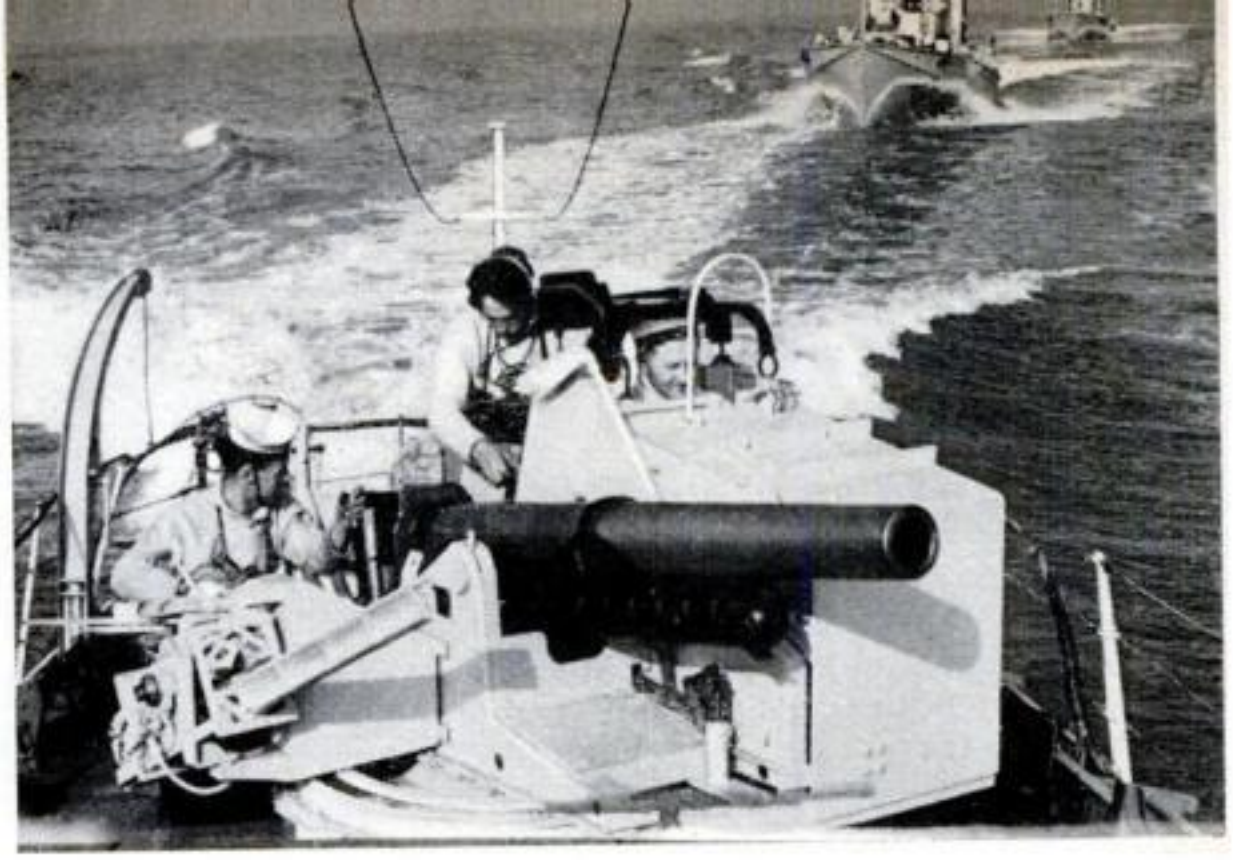
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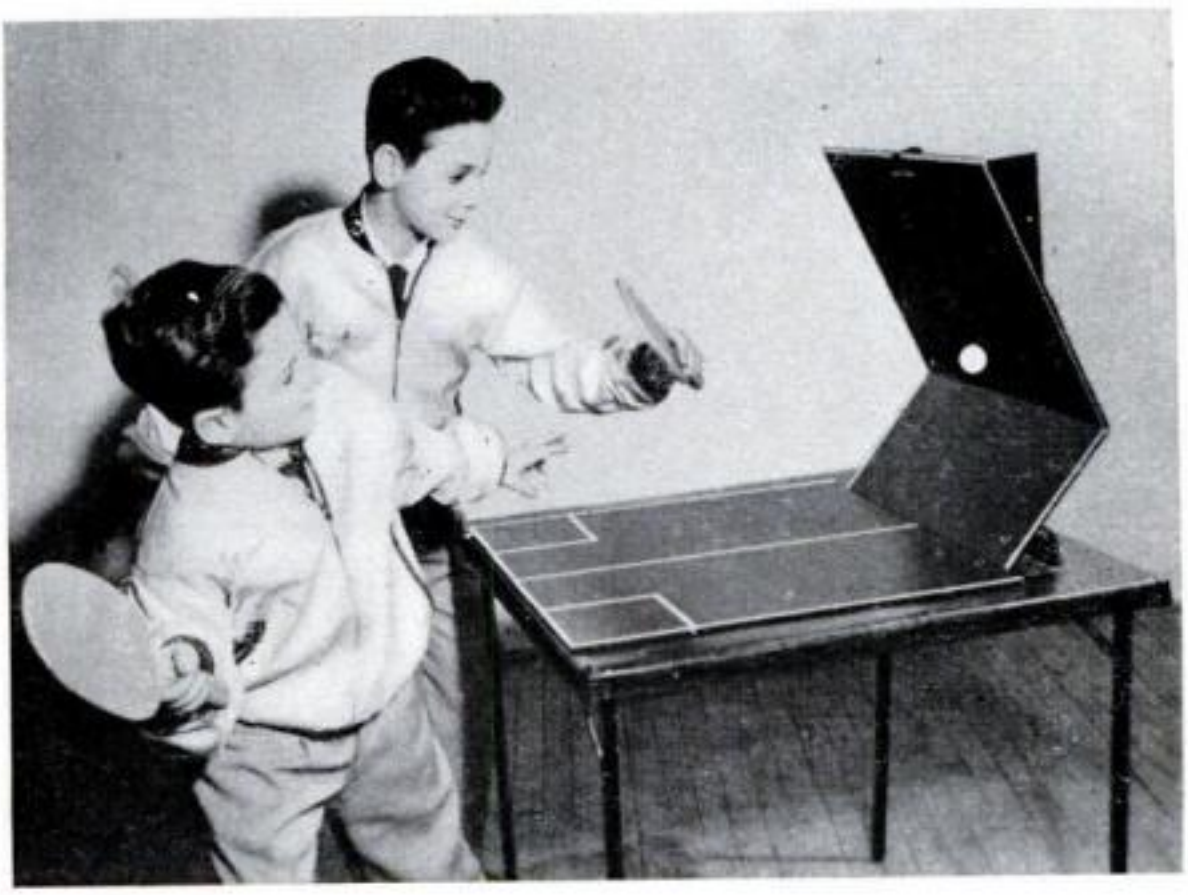
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## Little Warship Carries Big Gun

BRITAIN'S motor torpedo boats now pack a bigger wallop. They carry 4.5-inch guns (shown in the stern of boat in right foreground). Famous for their attacks on enemy shipping and harbor installations during World War II, the little boats took part in Allied naval exercises held in Baltic and Scandinavian waters this year.



## Game Has Backboard That Returns Ball for Next Wallop

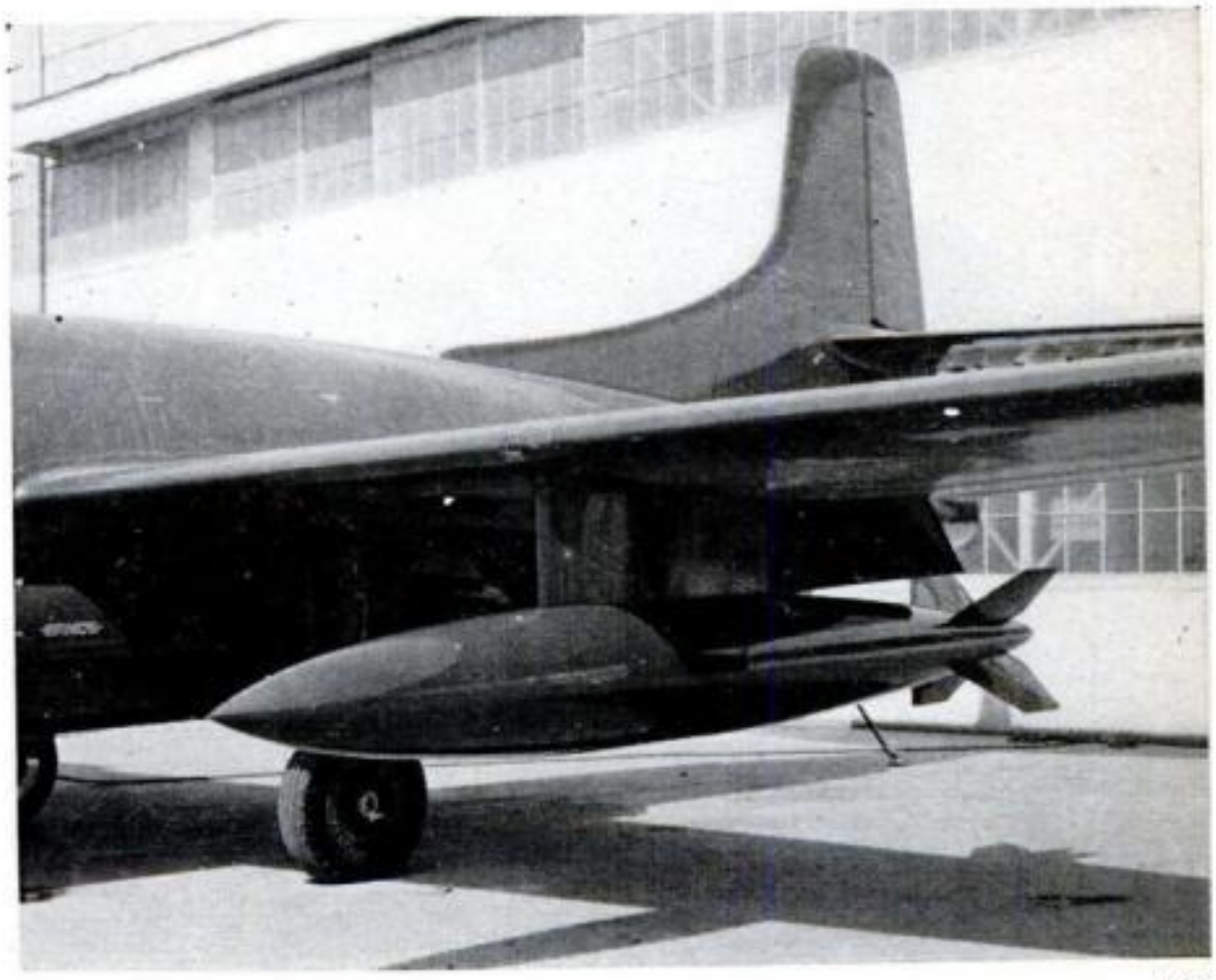


CROSS table tennis with handball and you come up with Bat-Bak. the fast new game shown at left. It can be set up indoors or outdoors, played alone or in competition. It's easy to play but also furnishes scope for a player's constant improvement.

There's a board to fit a bridge table, one that rests on a dining table, and one that stands on its own folding legs. There is also a double set of boards that fit back to back on a tennis table. Bat-Bak, 257 Fourth Ave., NYC, makes the game.

## Streamlined Bomb Ups Plane Speed

PLANES carrying this new cigar-shaped bomb can fly faster with a greater bomb load than planes lugging the World War II exploders. A bomber loaded with three of these "eggs" can travel 50 m.p.h. faster than a similar aircraft carrying only two old-style bombs of the same size. The X-shaped tail provides stability. Developed by Douglas engineers, the new bombs—called the Aero X-1A—are now being used by the Marines.





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# Car Carries Its Own Folding Garage



**1 CARRIED PIGGYBACK** on car and held securely by two light cords, this collapsible shelter serves as a traveling garage, boathouse, beach cabana, hunting or fishing lodge.



**2 UP SHE GOES.** After laying out parts, inventor Charles Margoles of New York City lifts one end, first step in setting up shelter. More than six feet high, 20 long and eight wide, it is big enough for any car or a small boat.



**3 TO BRACE SHELTER,** stretchers notched at ends are slipped into place. Wall ribs are bolted to base—strips of angle iron laid parallel on ground—at four places on each side to keep structure rigid in wind.



**4 A PULLEY SYSTEM** allows the front to be raised or lowered from outside, also serves to hold up the front when the shelter is used as a cabana or on camping trips. Unit has waterproof canvas walls and ¾-inch steel-tubing ribs.

**5 ONLY FIVE MINUTES HAVE ELAPSED** since shelter was removed from car. Now the car is cozily nested inside. Margoles calls his versatile invention a Porto-Shelter. It will be available in various solid colors as well as a two-color striped design. Price: about $100.

## Prospectors Now Seek

# Lithium, the H-Bomb Metal



**Fireworks occur as lithium burns with a dazzling light, scattering fiery bouncing fragments.**

***A strange element that floats on water and cuts with a knife is starting a mining boom to equal any gold rush in history.***

**By Alden P. Armagnac**

TODAY a little-known metal, and one of the most curious, lures prospectors. You can cut this soft, silvery substance with a knife. Lightest in weight of all the metals, it is about half as heavy as water, in which it floats. But it will exhibit this remarkable property only briefly—for it fizzes and, in a twinkling, disappears!

Lithium is its name. Comparatively few people have ever seen it. But some foresee that the next few years may bring a world-wide scramble for its ores—a "lithium rush" matching any gold rush of the past.

For lithium, there seems good reason to believe, may be called "the H-bomb metal." It is expected to play a key part in making the hydrogen bomb, the most awesome military weapon ever projected.

Top-secret as the H-bomb project is, it is no secret that if you bombard lithium with neutrons in a uranium pile, you will get "tritium," rare triple-weight hydrogen. This extra-heavy variety of hydrogen is believed —unofficially, at least—to be the kind most likely to be used in the hydrogen bomb. And the nuclear reactors of the billion-dollar Savannah River H-bomb plant, now rising in South Carolina, will be capable of making tritium from lithium on a mass-production scale.

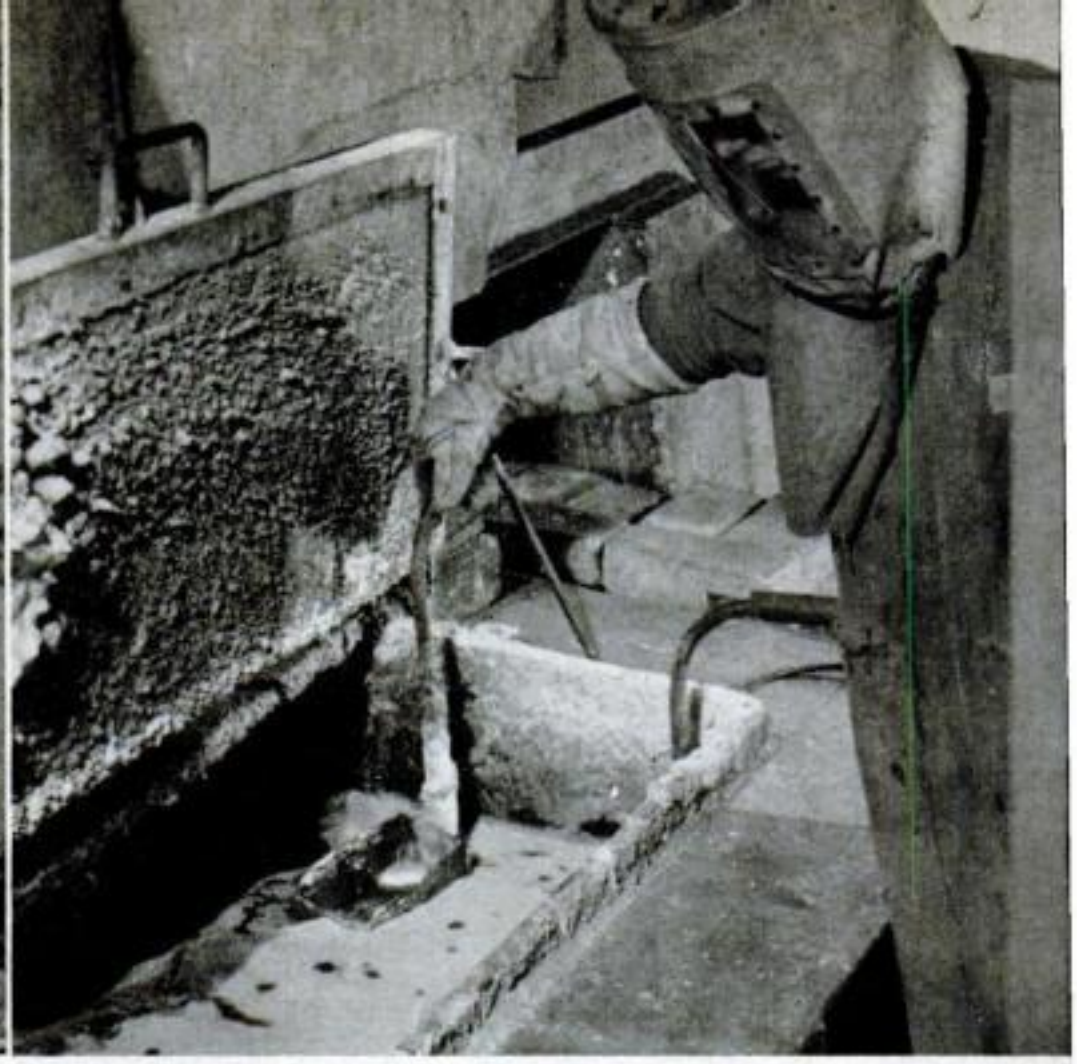
In addition, although this is pure speculation, lithium itself might actually be put



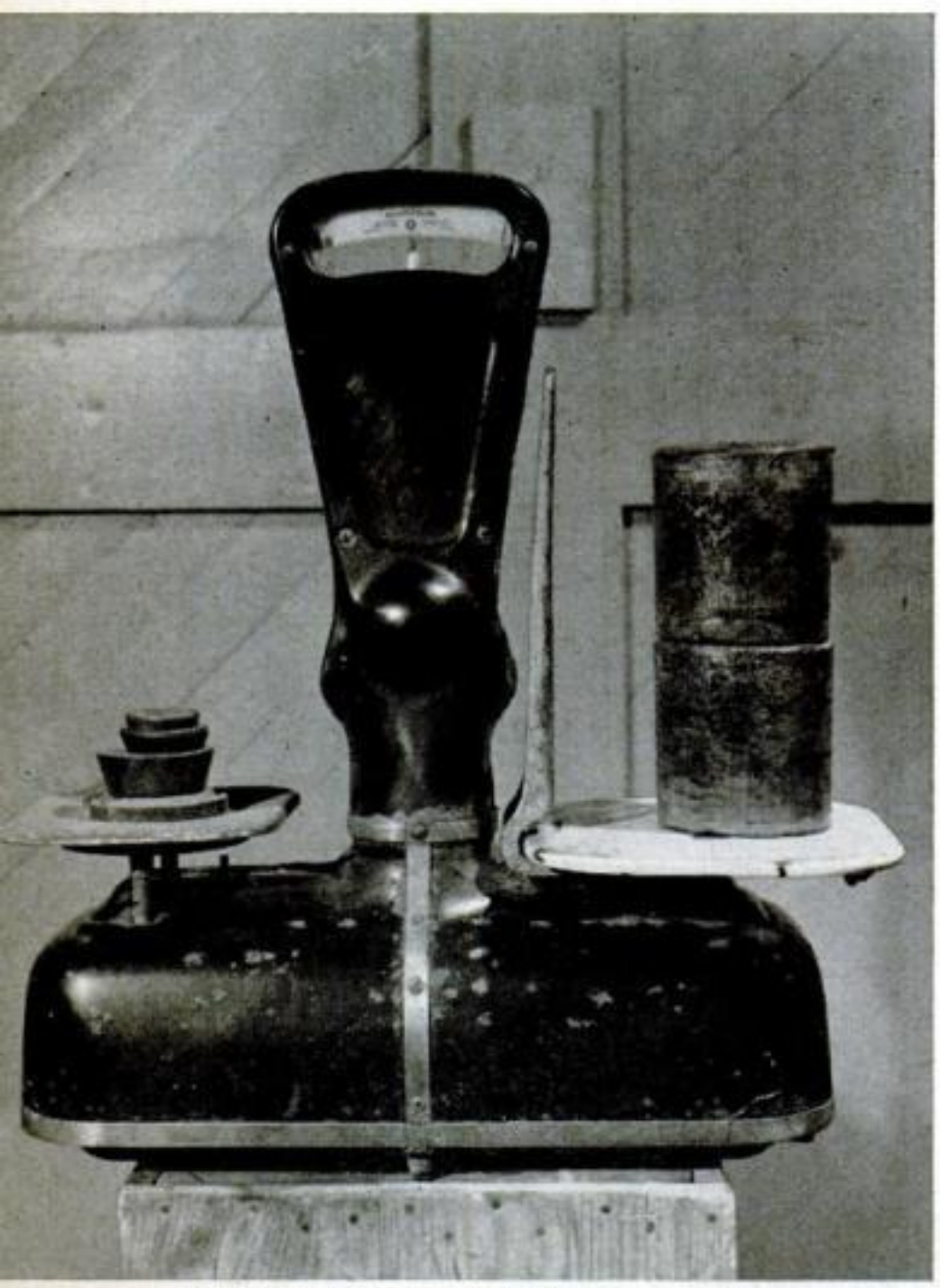
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**MINING LITHIUM** usually is "open-pit" or quarrying operation. Principal U. S. ore, spodumene, is supplemented by imports of another, lepidolite, mined in Africa (above).



**ELECTROLYTIC CELL** yields 90 pounds of lithium metal daily. Molten metal, floating on top of fused lithium-chloride bath, is ladled off and poured into molds to make ingots.



**SIZABLE INGOTS** of lithium metal on scales (right) are balanced by small weights shown. Lithium is lightest of all metals; ingots weigh only one pound 13 ounces apiece.

into H-bombs. Fusion-type atomic reactions between hydrogen and lithium are among those that could yield enormous energy, physicists have pointed out. Further, the purely mechanical problem of squeezing as much hydrogen as possible into a bomb might favor using lithium hydride—a solid lithium-hydrogen compound—in preference to pure hydrogen gas, which would need to be highly compressed or liquefied. And so, whether in one of these ways or more, lithium seems as indispensable a raw material for H-bombs as uranium is for A-bombs.

### *All-Purpose Grease*

Besides the H-bomb, there are other reasons for a suddenly awakened national interest in lithium. And one of these may have comparable importance from a military standpoint.

Planes, cars, trucks, gun carriages and tanks must be prepared to operate in conditions ranging from tropical heat to arctic and substratosphere cold. Hitherto they have required a special lubricant for each type of service. Now comes the discovery of a "wonder" grease that retains its lubricating qualities at extremes of temperature from 320° above to 60° below zero. The new ingredient that gives it this ability is a soaplike compound of lithium called lithium stearate. It seems likely that the all-purpose lithium-base grease can replace many other



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**LITHIUM METAL in form of wire and ribbon serves as catalyst in such chemical processes as making synthetic vitamins. Coating of petroleum jelly or heavy oil, protecting shiny reactive surface from air, is easily removed just before use. Also available are "cartridges" of lithium metal for use in making copper of high conductivity.**

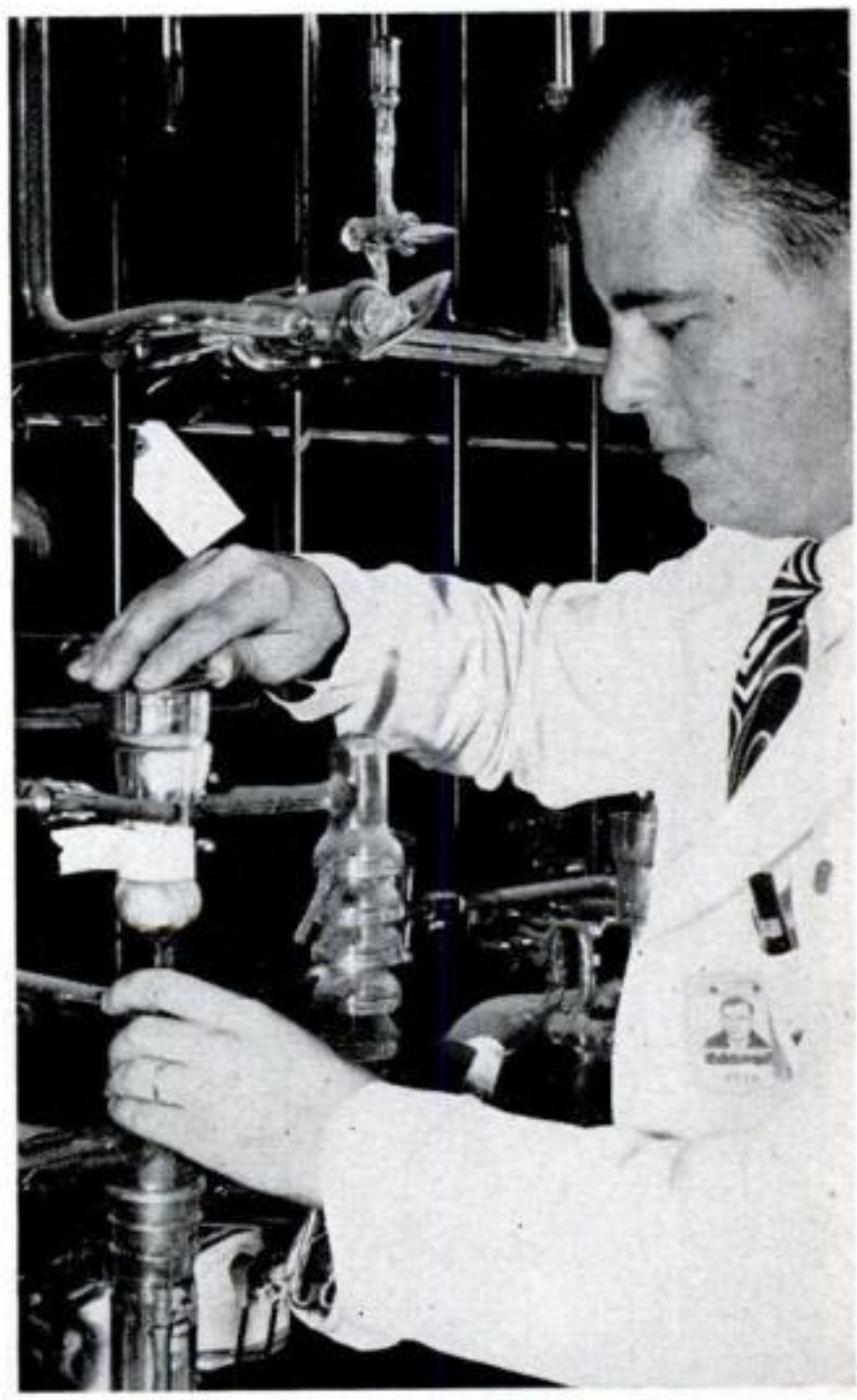
kinds, a simplification of utmost significance to the armed forces. "It has been estimated," says a recent editorial article in *Industrial and Engineering Chemistry*, "that lubricant demands of the military alone, if fully satisfied, would consume the entire present production of lithium in the U.S."

Fortunately this country ranks among the most favored of nations in known lithium resources. Working these on a modest scale, in the past, has yielded enough of the metal and its compounds to meet commercial needs. Now production is shifting into high gear.

A big flotation mill, newly erected by the Lithium Corp. of America at Hill City, S. D., boosts by 50 percent that company's former output of lithium metal and chemicals. Power shovels scoop the raw material, a white rock called spodumene, from nearby open-pit mines. Vertical mine shafts, extending 200 feet deep or more, supplement this quarrying operation.

### *New Source Tapped*

A vast deposit of the same ore has been found at Kings Mountain, N. C.—once the scene of a gold rush and also the site of an unprofitable and abandoned tin mine. By buying this "mountain of lithium" and mining it in open-pit fashion, the Foote Mineral Co. is supplying the raw material for a new $215,000 extraction plant that doubles its



**TRITIUM, the kind of hydrogen that may be used in H-bombs, is purified with apparatus above, after being made from lithium in atomic pile at Argonne National Laboratory.**



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previous production of lithium chemicals.

Spodumene ore is a lithium-aluminum silicate. In one way to extract the lithium, by acid and heat treatment, you first get lithium carbonate; further chemical steps convert it to other desired salts, including lithium chloride. Then, fusing lithium chloride and passing 8,600 amperes of electric current through it in an electrolytic cell yields pure metallic lithium.

### *Comes as Wire, Ribbon or Cartridge*

If you go shopping for lithium metal, you will find that you can buy it as wire wound on wooden spools and as ribbon coiled on reels. These are the forms in which it is sold for its principal use to date—as a catalyst, or chemical-reaction promoter, in such processes as manufacturing synthetic vitamins.

You can also buy lithium "cartridges"—short lengths sliced from a rod of the metal and hermetically sealed in copper tubing. They permit adding a tiny, carefully measured fraction of a percent of lithium to molten copper, in a foundry, producing sound copper castings of high electrical conductivity. Lithium metal in larger proportions improves the strength of aluminum and magnesium alloys and hardens lead-base alloys used in railway bearings.

Lithium is a bona fide chemical element—No. 3 in the chemist's list of them, preceded only by hydrogen and helium. And it is an extremely active one. Dip lithium wire or ribbon in water, and it vanishes in a vigorous reaction, forming copious bubbles of hydrogen gas and leaving behind a solution of lithium hydroxide. This resembles the reaction of metallic potassium with water, a more familiar chemistry-classroom spectacle, except that in this case the gas does not take fire.

Simply ignite a piece of lithium wire or ribbon, however, and you will get plenty of fireworks. Like magnesium, lithium metal will burn, with dazzling white light and intense heat.

In an atomic furnace, lithium captures neutrons and immediately turns into a mixture of two gases—tritium and ordinary helium. These are readily separated, since tritium will combine with oxygen, forming "extra-heavy" water and leaving the helium behind. Then the purified tritium may easily

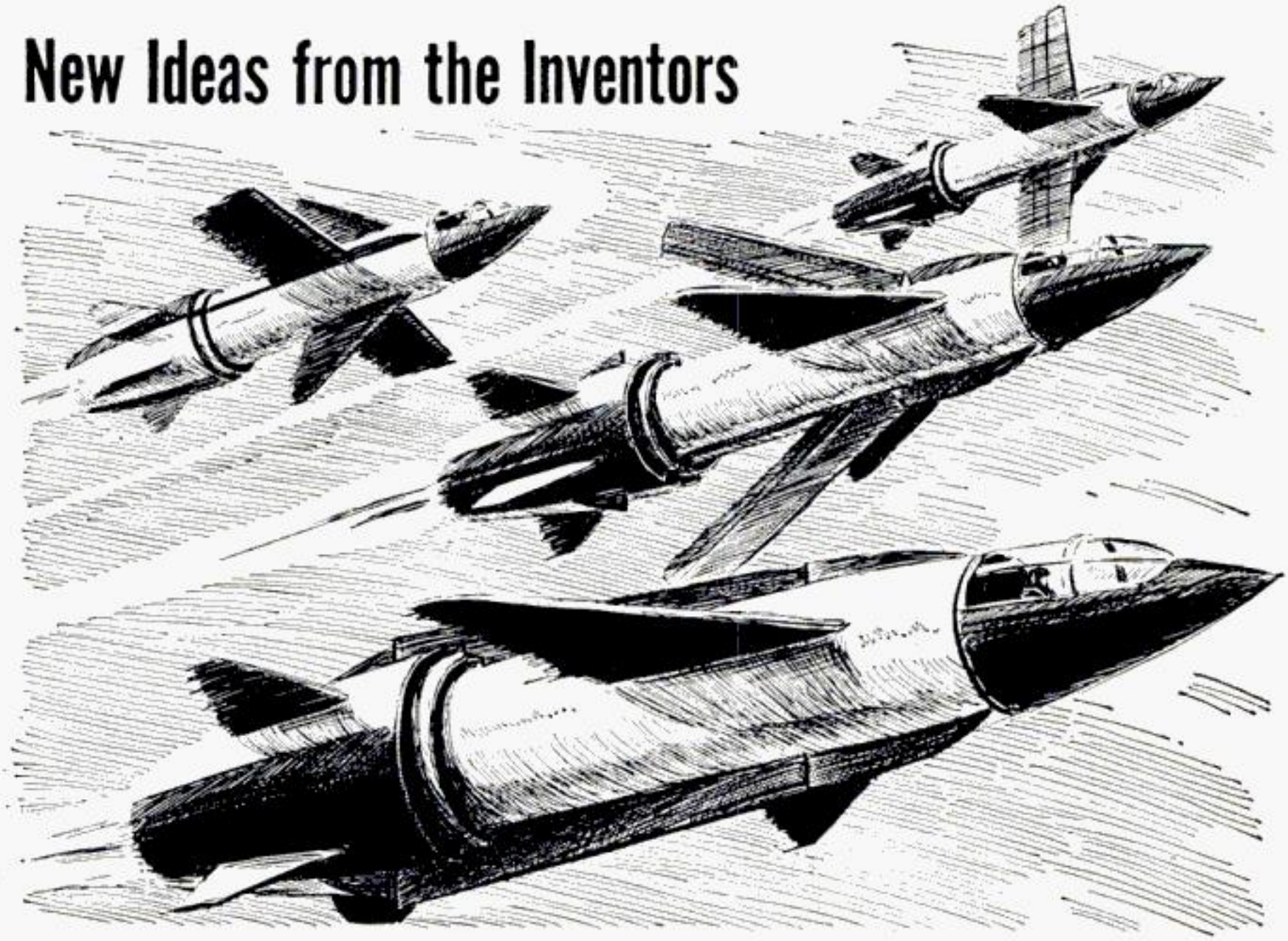
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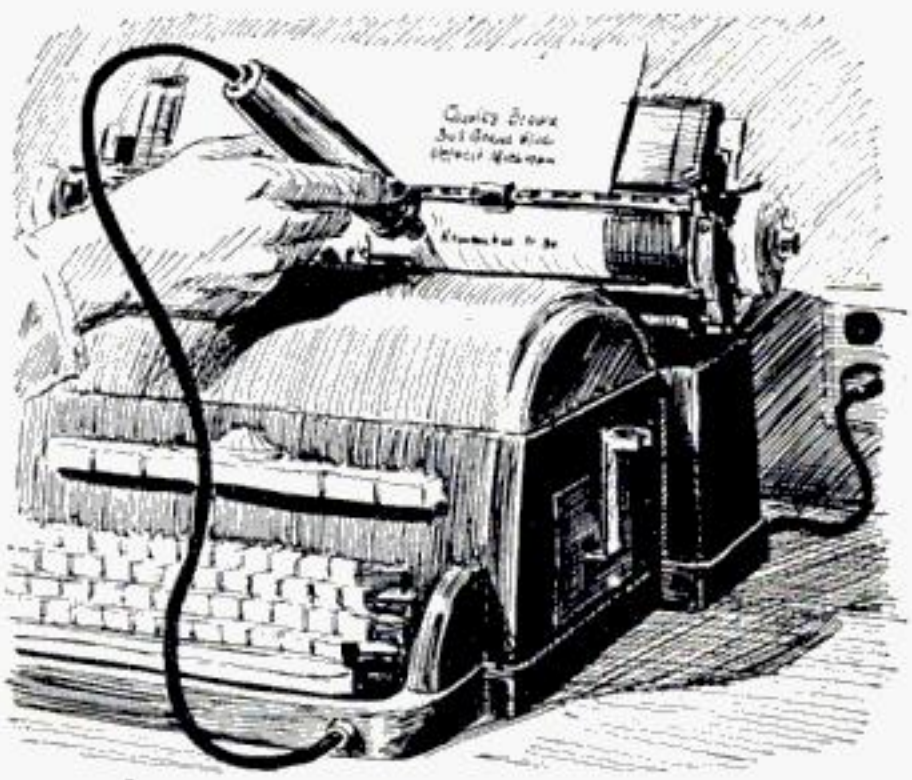



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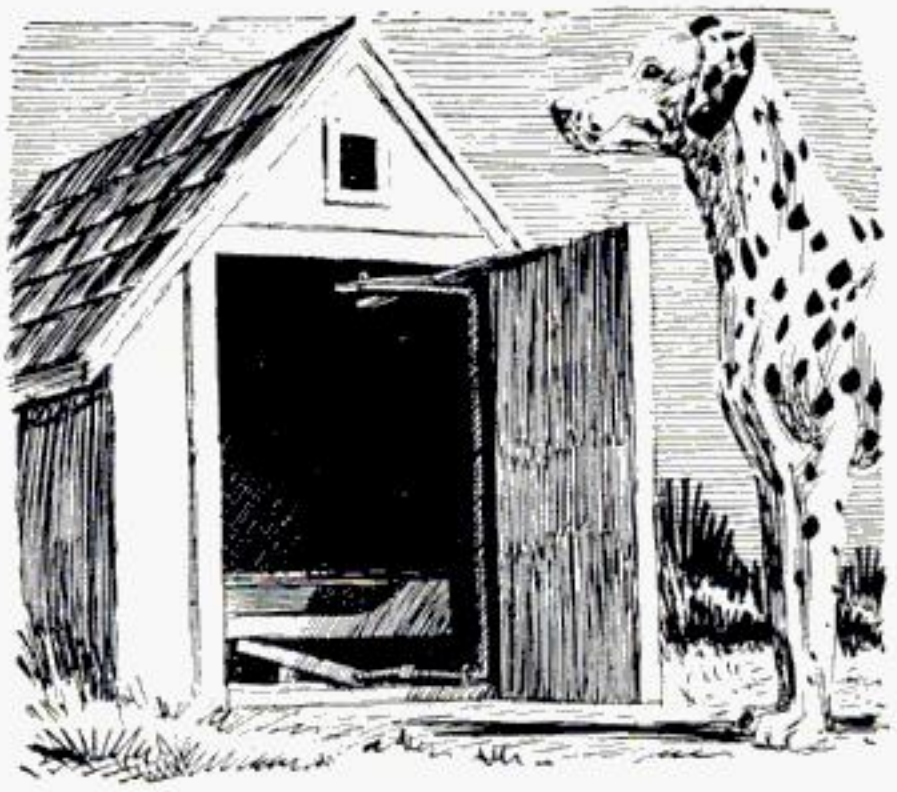
# New Ideas from the Inventors



**1 Plane to Change Wings in Air.** At low speed the plane above would use large wings for greater lift; at supersonic speed, it would switch to stubby ones perpendicular to the others to cut drag. To change over, the center fuselage section would revolve 90°, then the large wings would retract into the fuselage. For take-offs and landings with the large wings, the shorter wings would retract in the same way.



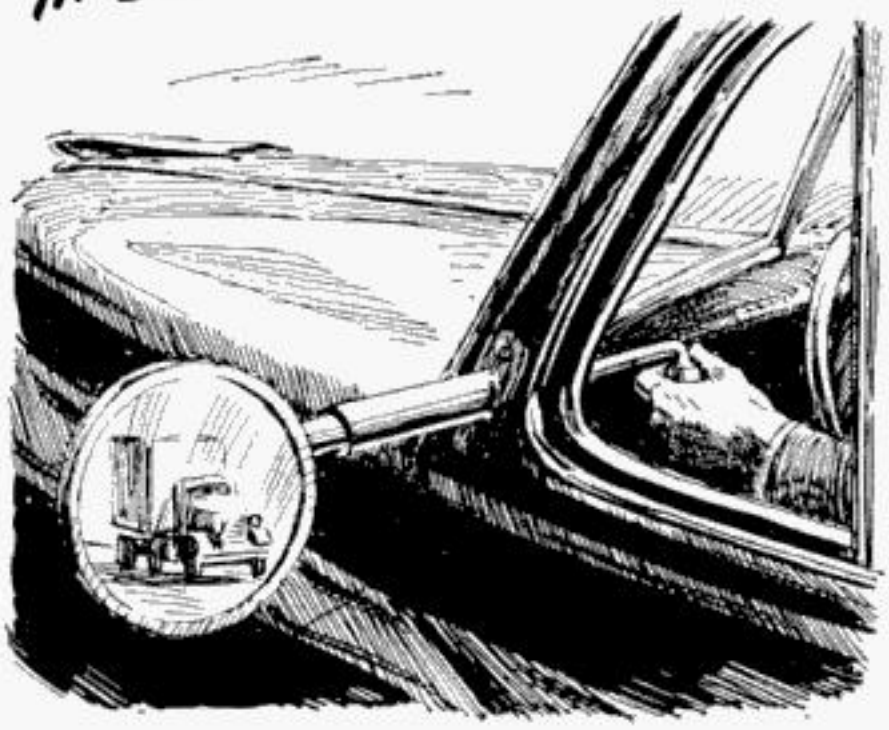
**2 Typewriter to Power Eraser.** You can make mistakes faster with an electric typewriter—and you could correct them faster, too, with this electric eraser attached to it. Remove the eraser from its spring-clip holder, and the typewriter's own motor would spin a replaceable rubber erasing tip through a flexible cable.



**3 Dog to Close Kennel Door.** When Rover got into his bunk in this doghouse his weight would actuate a lever linkage to close the spring door against the weather. When he stepped out, the door would open. Should he refuse to emerge at his master's call, he could be reached through an easily removable section of the roof.

***Please turn the page for more new ideas.***

## MORE New Ideas from the Inventors



**4 Handle to Adjust Car Mirror.** If two or more people drive your car, this inside-controlled mirror could settle old arguments. Each driver could set the mirror to suit himself. The handle would also allow you to extend, angle or tilt the mirror to see around curves and obstructions or to deflect headlight glare.



**5 Pipe to Light Itself.** A pipe smoker could leave his matches at home if he had a lighter like this built into the stem of his briar. Folded, the lighter would look like part of the stem. In use it would lift up to hold a flame directly over the tobacco bowl. The user could raise and strike the lighter with one hand.



**8 Chair to Change into Table.** One piece of furniture made like this would give a lot of mileage. It could be folded flat for storage or unfolded into a table, an upright or reclining chair, or a couch. The arms and footrest would swing themselves into position when the back was moved.



**9 Refrigerator to Fit Corner.** Designed to make better use of kitchen space, this refrigerator would fit snugly in a corner. Two straight sides and a curved front would enclose circular, rotating shelves. Shelf sections would hook onto a center post, could be unhooked for removal and cleaning.



**6 Trouser Cuffs to Clip On.** You could alter the lengths of trousers yourself if the manufacturer provided clip-on cuffs of the same fabric. They could be unclipped to simplify pressing. Frayed cuffs could be replaced quickly and inexpensively and trousers could be lengthened to keep pace with growing youngsters.



**7 Wrench to Loosen Jar Caps.** You would never have to wrestle with frozen jar caps if you had this wrench to coax them open. Jaws joined by a threaded shaft could be tightened by a twist of the handle, and turning the handle would provide enough leverage to free any cap. The wrench could also be used to seal jars tightly.



**10 Carrier to Slide Spare Out.** The spare tire would always be easy to get at if it were carried under the rear overhang of a car on a let-down sliding shelf like this one. You wouldn't have to disturb luggage in the trunk, and the tire could be rolled rather than lifted in or out. Raised, the carrier would be hidden by the bumper.

***Patents on these inventions have been granted to: 1. R. Robert, Boulogne-sur-Seine, France; 2. M. Alden, Tulsa, Okla.; 3. G. Blatchford, Los Angeles; 4. R. Goldstein, Pittsburgh; 5. G. O'Neill Jr., Yonkers, N. Y.; 6. H. Lewallen, Anderson, Ind.; 7. J. Fay, Villa Park, Ill.; 8. D. Rizzolo, Bloomfield, N. J.; 9. R. Paul, Millard, Neb.; 10. J. Selzer, Ft. Wayne, Ind.***



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# Bright Ideas

# Put Teen-Agers in Business

***High-school students who become manufacturers one night a week make fast-selling items out of stuff often headed for the junk heap.***

**By Stephen R. Philips**

BUSINESSMEN not yet out of high school have proved that you can sell a lot of discarded bottles, empty beer cans and outmoded telephones—if you're only as ingenious as they are.

Ingenuity pays dividends, they have learned from a national organization called Junior Achievement, Inc. Now celebrating its tenth birthday, JA has taught the facts of business life to 73,000 high-school juniors and seniors—and more young people will become Junior Achievers this fall, almost as soon as school reopens.

In 63 communities in 22 states last year, more than 14,000 of these young men—and women, too—organized 1,266 companies that turned out an astonishing range of products, from bubble-bath crystals to lamps that are made out of glass bricks.

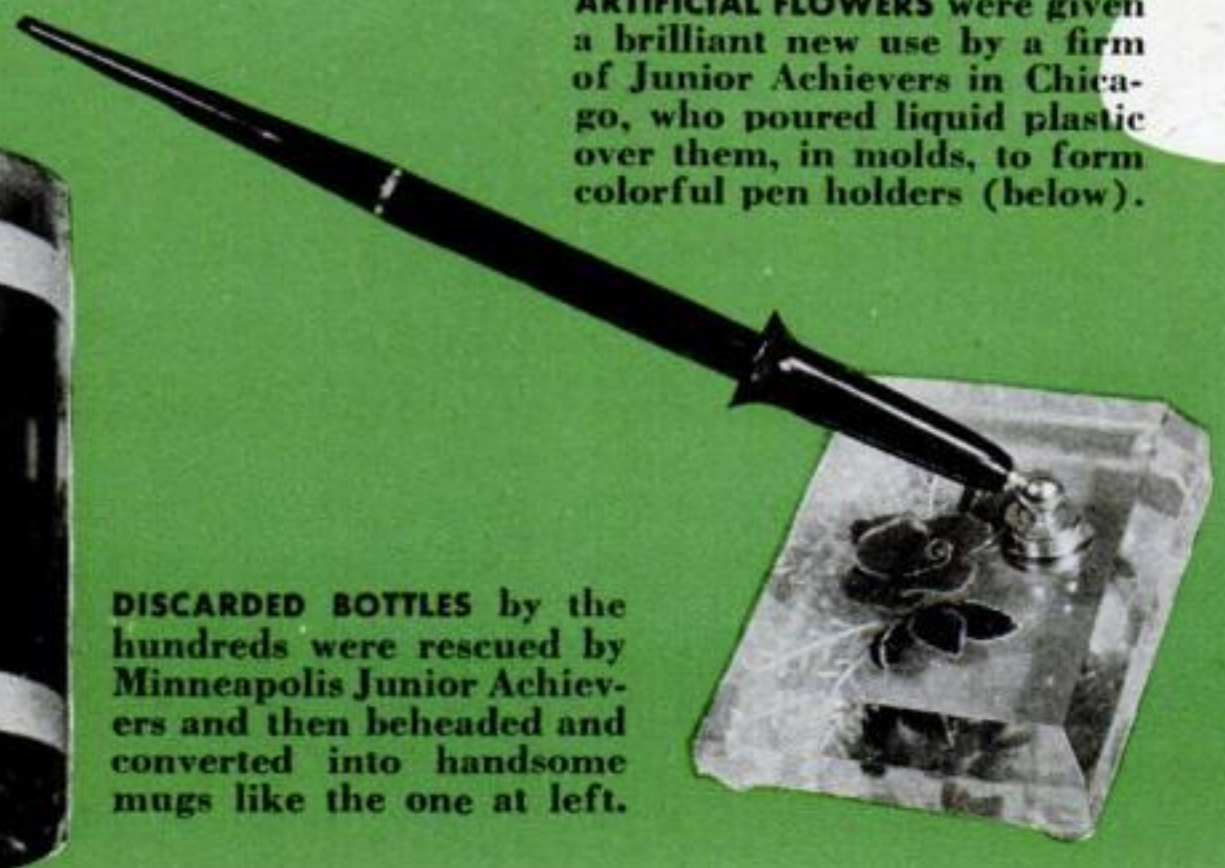
The average company had 12 employees, who worked one night a week at wages of 10 to 20 cents an hour. One or more adult advisers, supplied by a sponsoring local or national firm, helped them smooth out production problems. Many a well known firm was among the hundreds of sponsors: U. S. Steel, General Electric, Esso Standard Oil, General Motors, Allis-Chalmers, International Harvester.

Working capital came from 101,000 interested citizens of the communities in which the JA firms were located. They bought shares in the various enterprises at 50 cents a share and sometimes made as much as five percent on their investments. The investors got their principal back at the end of the school year.

The youngest junior executives, salesmen,



**DISCARDED BOTTLES** by the hundreds were rescued by Minneapolis Junior Achievers and then beheaded and converted into handsome mugs like the one at left.



**ARTIFICIAL FLOWERS** were given a brilliant new use by a firm of Junior Achievers in Chicago, who poured liquid plastic over them, in molds, to form colorful pen holders (below).

A noisy argument over what to charge for lawn coasters enlivens a JA directors' meeting.



**THIS HANDSOME LAMP** is a JA triumph. Its copper base was once the top of a slightly flawedcoffeemaker.

**ONCE A BEER CAN,** emptied and tossed aside, the attractive watering can below was the creation of a smart group of Junior Achievers in Dayton. They also made popular clothes sprinklers from the same raw material.





**OLD-FASHIONED TELEPHONES** that were a drug on the market were bought at salvage prices by Toledo Junior Achievers, who removed the enamel finish and made lamp bases of them.



**NO LONGER UNWANTED,** as lamps the brass telephones sold like ice cream on a hot day.

bookkeepers and craftsmen were 15. The oldest were 20. When a Junior Achiever becomes 21, he has to resign.

It was a teen-age group in Minneapolis, calling themselves the Achievers Manufacturing Co., who made clever use of discarded bottles. After collecting them, at no cost, they first washed and sterilized the bottles, then broke off the necks. This last task was uncertain and dangerous until someone thought of doing it with a strand of electrically heated wire looped around the bottle. The bottle was rotated as the wire grew hotter, until the neck broke off clean. The young workmen then filed and smoothed the rough rims, fastened broad metal strips around the bottles near the tops and bottoms, and attached heavy wooden handles to the strips. The completed mugs were handsome, were priced at $2 for a set of four and sold at a breathless pace.

### *Sprinklers from Beer Cans*

A Dayton firm of Junior Achievers did equally well with empty beer cans. They converted them into two popular products: watering cans and clothes sprinklers. For both uses the beer cans were painted and decorated with decals. Making clothes sprinklers of them was merely a matter of substituting perforated metal caps for the original tops. To make watering cans, the kids on the production line pierced each beer can near the bottom, cut a straight length of spout and made a gooseneck of it, sawed and burred a lip of the spout, cut and formed a tin handle and finally soldered spout and handle to the by-then unrecognizable beer can.

Junior Achievers work in leather, plastic, wood, metal, ceramics, textiles and even chemicals. They make ashtrays, costume jewelry, toys, salt shakers, book ends, shaving lotions, pen holders, spot removers, lawn coasters, automatic closet lights, radios. Groups that didn't happen to be clever with tools have made a commercial success of baby sitting, providing live models for advertising agencies, publishing small newspapers, preparing radio shows and even operating pint-size banks.

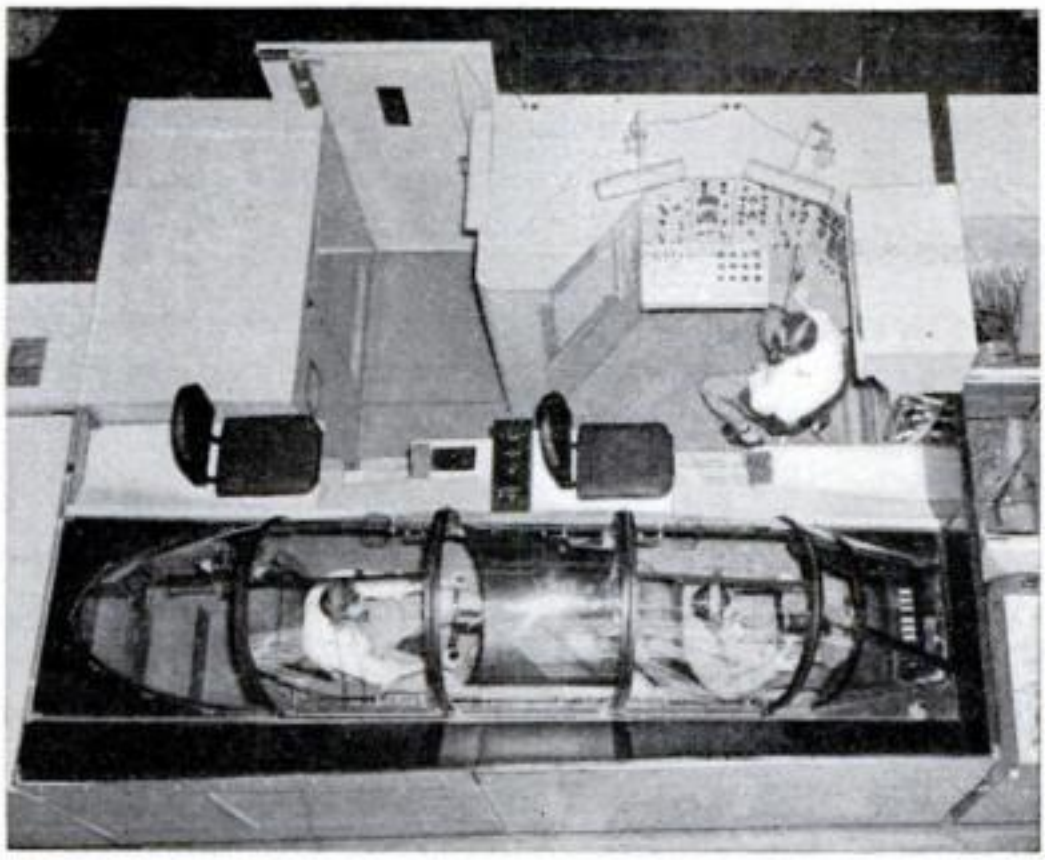
### *They Bought a Locomotive*

A firm made up of several members of Houston's soda-fountain set carried out a highly rewarding salvage operation. For a very low price, they bought an old locomotive that a local firm was permitting to rust away. Then they swarmed all over it, dismantling it piece by piece, and sold the parts to scrap-metal dealers at fancy profits.

Many a teen-age firm has shown plenty of enterprise as well as ingenuity. One called Crafts Unlimited, in San Francisco, manufactured log centerpieces for table decorations. Not only did the young businessmen make and market their product—they shouldered axes, trekked into the woods and cut down their own trees. END

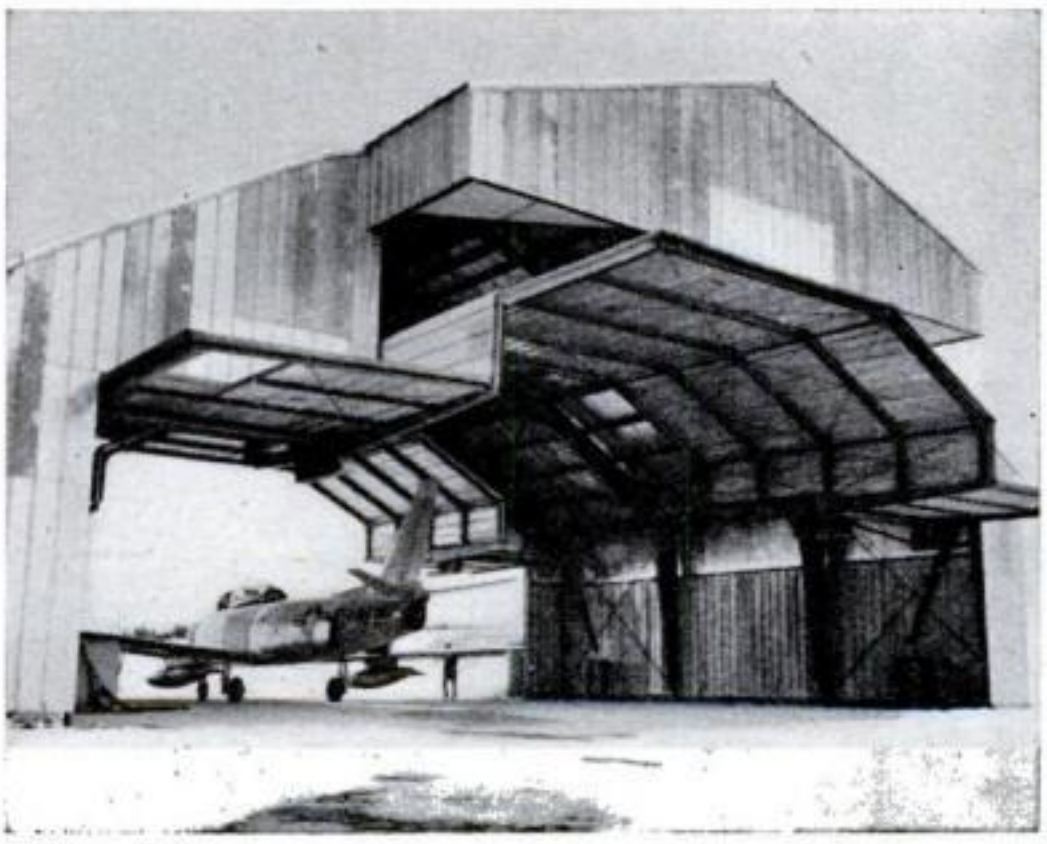


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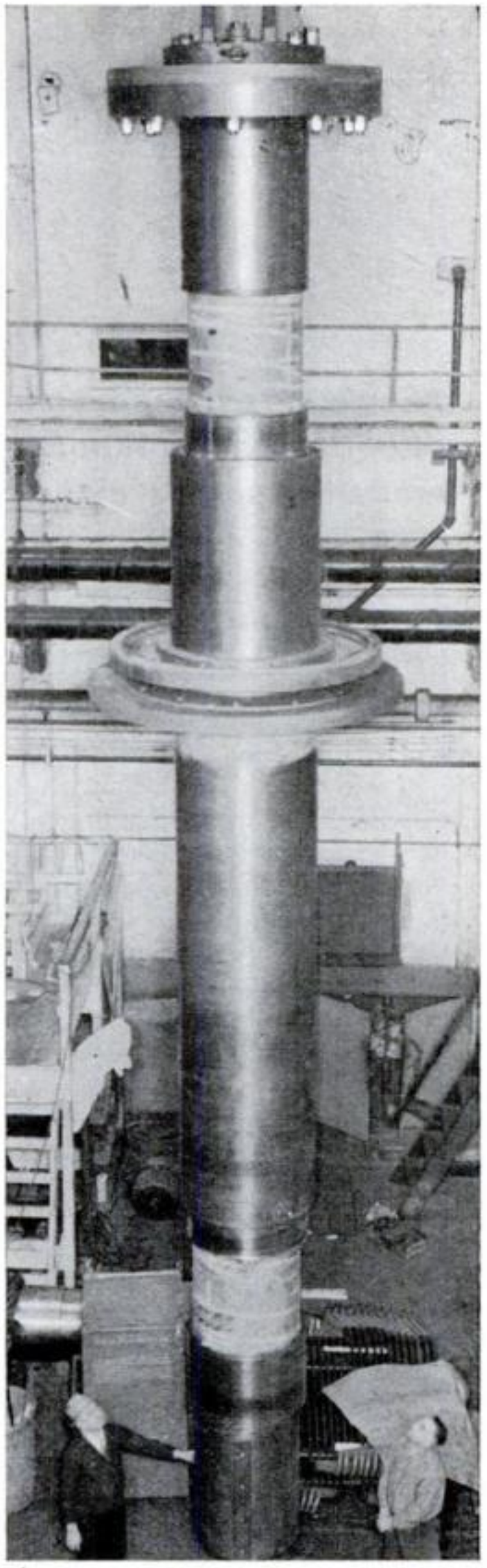
## For Jet Pilots to Learn On

HERE'S a topside view of the newest Air Force flight trainer. It's the first jet simulator for training B-47B Stratojet pilots. The tandem cockpit in the foreground holds pilot and co-pilot. Beyond it are two observation seats for instructors. In the background is the control station. A canopy encloses pilots and observers when the electronic trainer is in use. Link Aviation, Binghamton, N. Y., designed and built the flight trainer.



## Hangar Gets Planes Out and Up Fast

INTERCEPTORS at Burlington, Vt., can be in the air to challenge enemy bombers in less than three minutes. A hangar with push-button doors at front and rear cuts out plane jockeying on the ground. On the signal to "scramble," doors are opened, pilots start plane engines in the hangar and taxi right onto the runway. Returning planes enter via the rear doors which also act as a vent to carry off exhaust blast when jet engines are started up.



## Big Shaft for New Motor

THIS huge steel shaft, 31 feet long and weighing 45 tons, will go to work as part of the world's most powerful electric motor—an 83,000-horsepower giant built by Westinghouse. The use to which the motor will be put is anybody's guess. No information on the subject is being disclosed.



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# British Build Plastic Wings

***They will test them on a jet of delta design. Whole planes made the same way may follow.***

IN A converted streetcar barn 30 miles south of London, a tiny team of British scientists in the government's Royal Aircraft Establishment are getting plastic ready to take over aluminum's job in airplanes.

The RAE men say their new plastic plane skin will cut the cost of a wing or fuselage in half. They claim it will shave two years off the four it now takes to bring a newly designed model from blueprints to production. They say it will double or treble the number of planes made each day.

Other advantages they see for their material: smoother surfaces for faster flights, and a 20-percent-lighter air frame, which will increase the usefulness of engines.

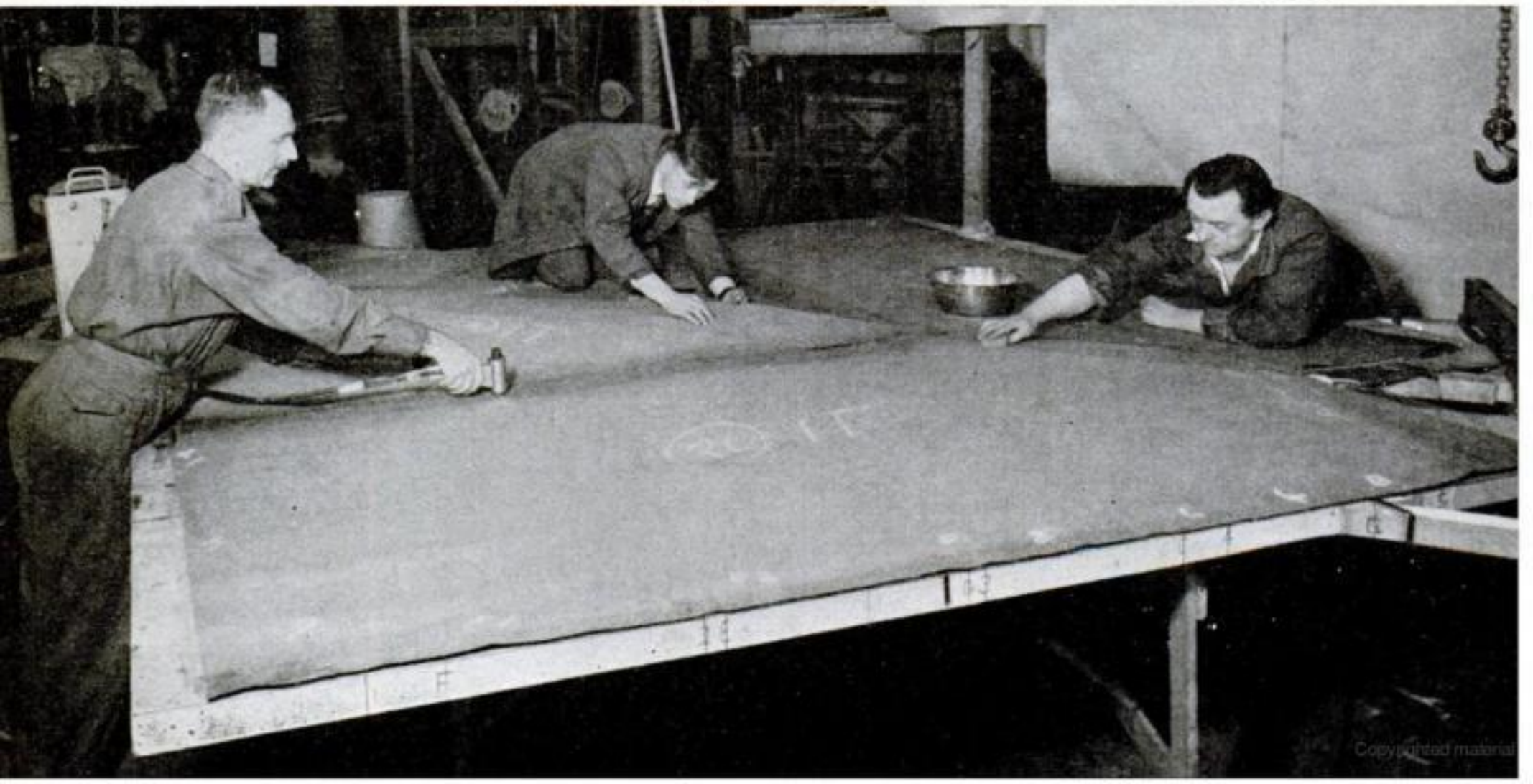
To prove that their plastic can take a beating in flight, the RAE men plan soon to attach two plastic wings to the fuselage of a secret new delta-wing jet fighter. The hybrid plane may fly this month. Since the wing is subjected to greater flight forces than any other structural part, proof that the plastic wing stands up will open the way to all-plastic air frames.

The material used is asbestos impregnated with phenol formaldehyde powder. Mixing the chemical with the mineral fiber produces feltlike sheets that can easily be cut and shaped and then baked hard without the need for expensive high-pressure molding machines. The accompanying photos show four stages in the process.

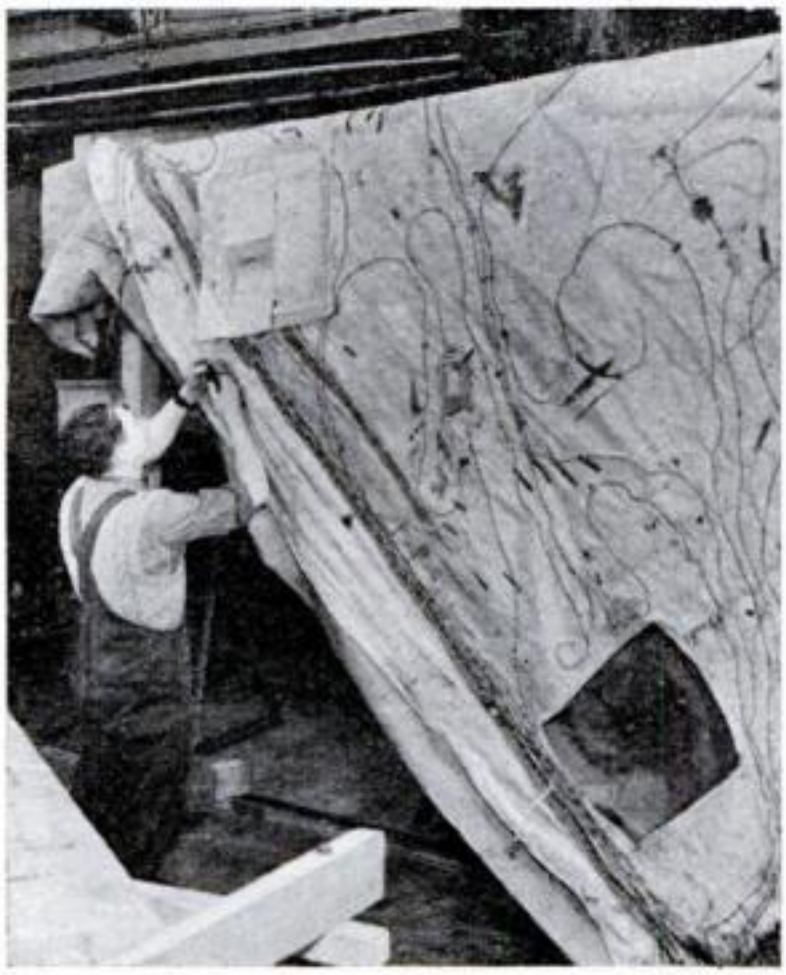
The wing is produced in two layers—an outer one and an inner one. The outer shell is baked to the inner one after the latter has already been fitted with ribs and other necessary innards. But each shell is first baked by itself, so that it can be worked on more easily.

Even if tests prove its superiority, however, plastic is not likely to begin pushing metal out of the sky in any big way at once. For one thing, the British scientists believe they can improve the material. By combing the asbestos fibers at a certain angle instead of letting them lie as haphazardly as nature has, they believe they can eliminate the material's one major flaw: the fact that it doesn't take twisting stresses quite as well as metal does. Swept-back wings are especially subject to these forces. That's why they chose a delta-wing plane for flight tests. —*Mitchell Gordon.*

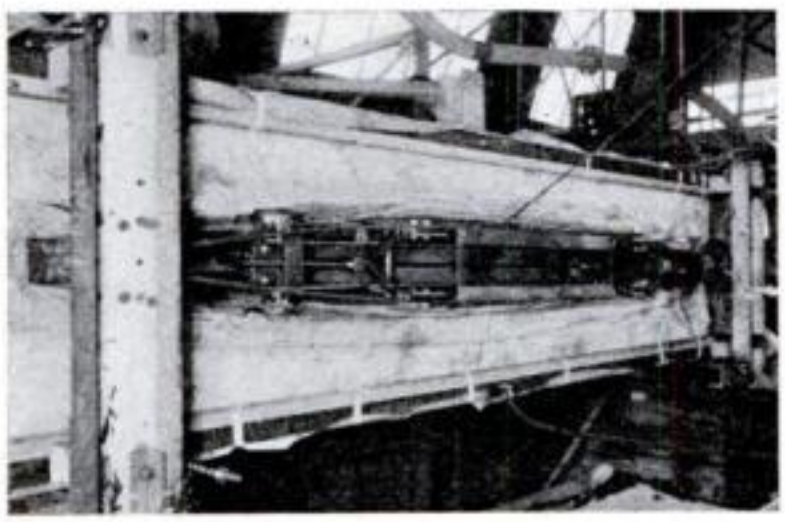
**1 WELDING FELTLIKE PLASTIC SHEETS with a high-frequency electronic iron. When the plastic fabric is thick enough for baking, it is draped over a wing jig that is covered with an inflatable rubber bag, and it is then shoved into an overhead oven of similar shape.**



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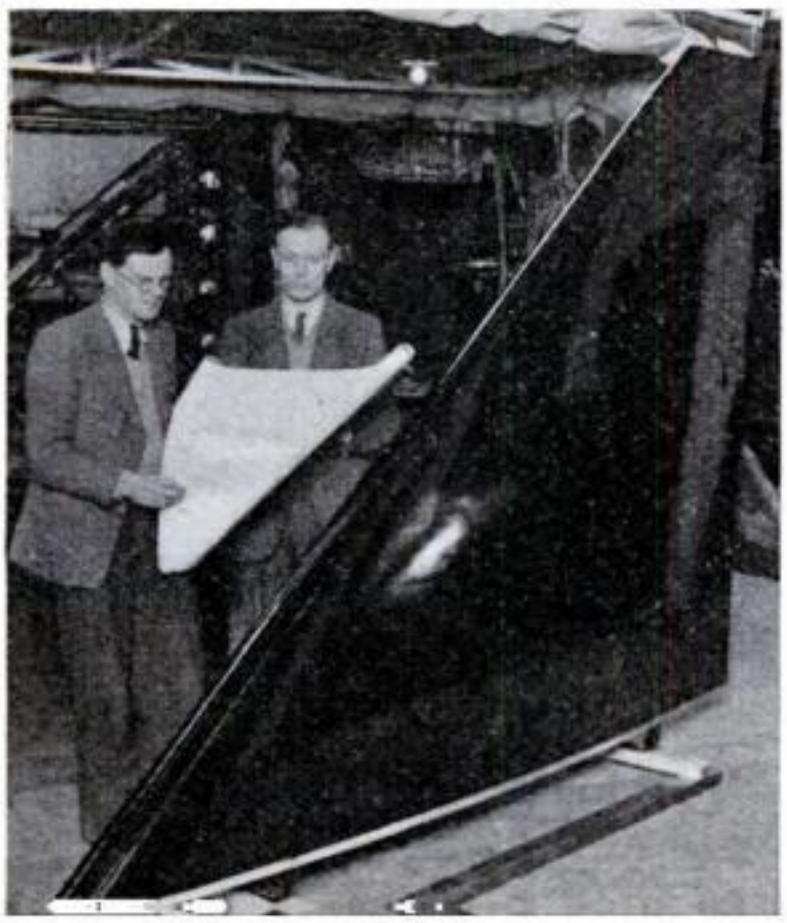


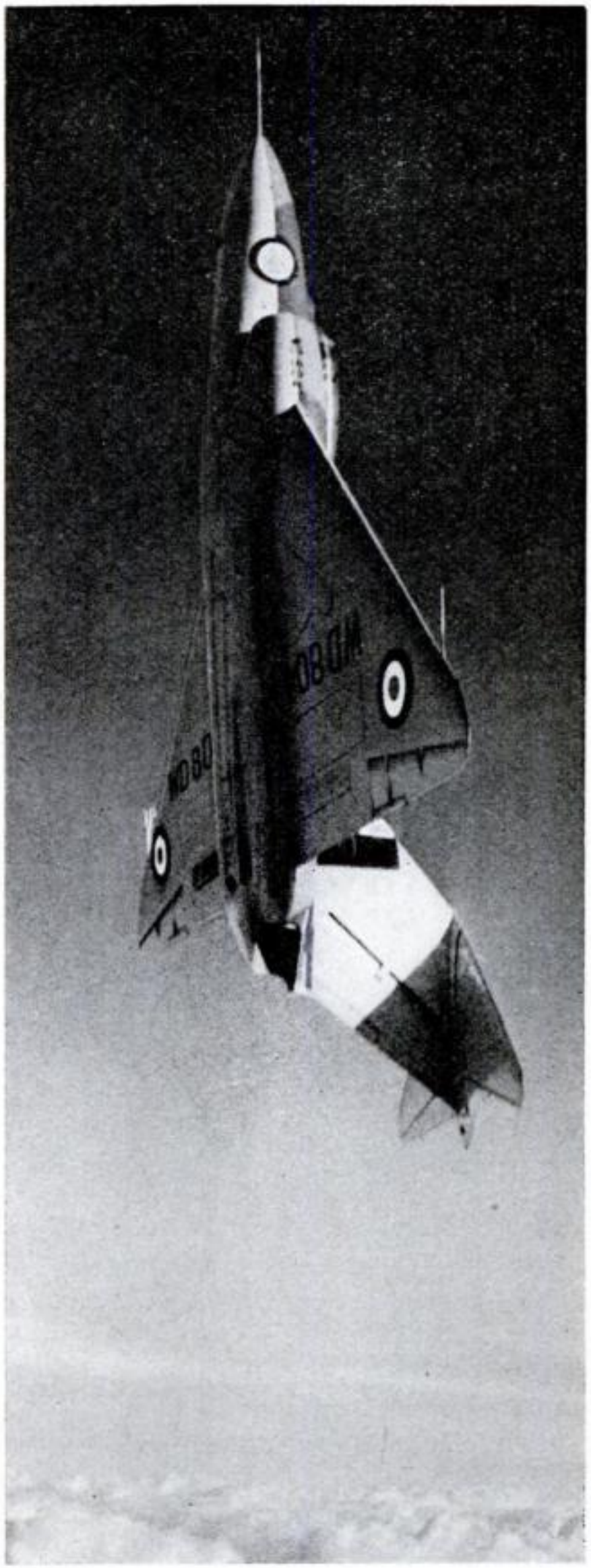
**2 DRAPING A WING JIG** with the inflatable rubber bag prior to covering it with the plastic sheet. The bag will press the plastic sheet against the oven lining.



**3 OVERHEAD OVEN** where wing is being baked. Vacuum exists between plastic and oven lining, so atmospheric pressure forces rubber bag against plastic.

**4 FINISHED PLASTIC WING,** though not one that will be flight-tested, is checked against blueprints by two of the British scientists who developed process.



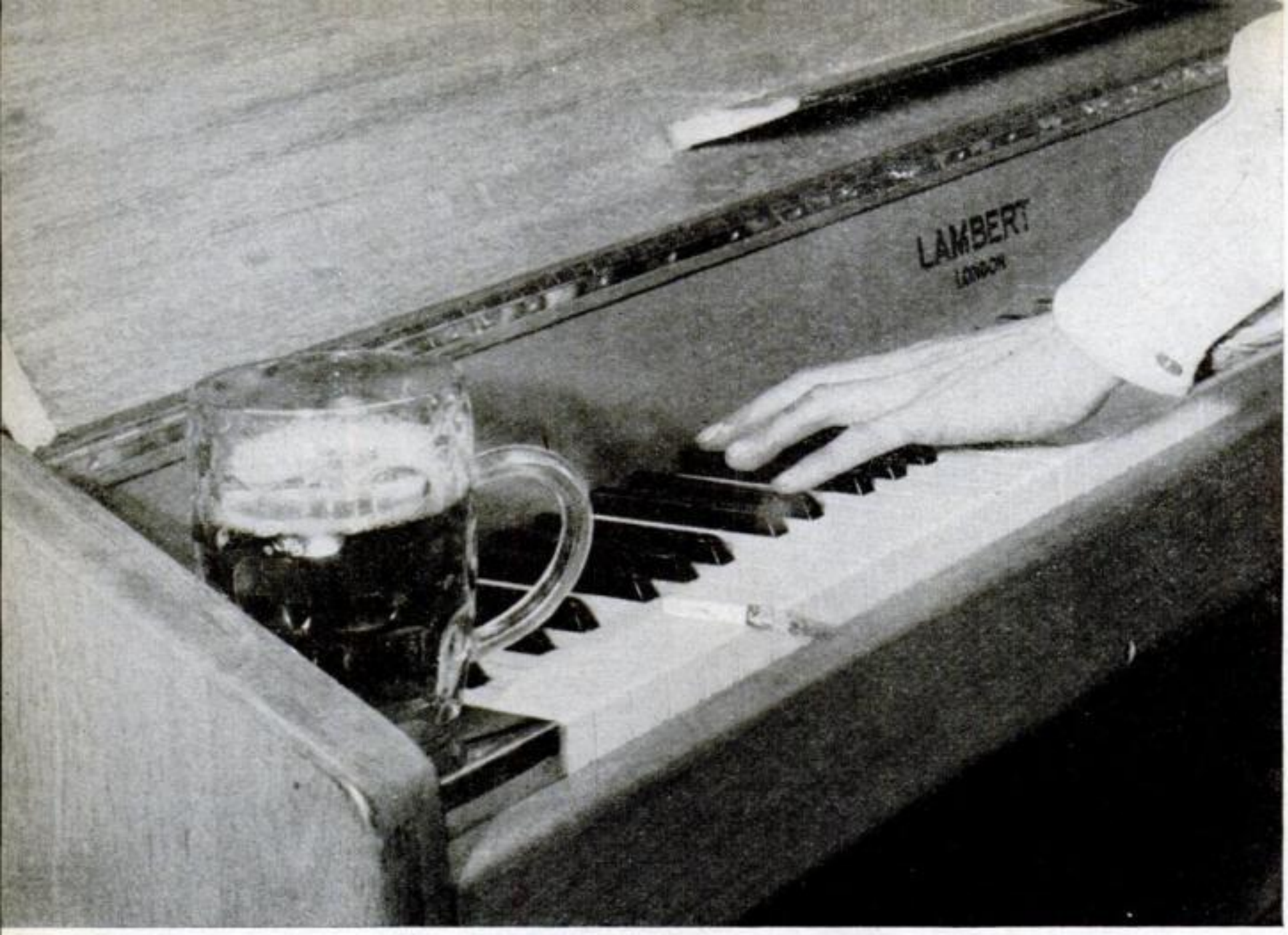


## Heading Straight "Upstairs"

A BRITISH night fighter of the delta-wing type that will test the plastic wings described on these pages is shown in a spectacular vertical climb. The plane, now in full production for the RAF, is a Gloster GA-5. It flies faster than sound, its two Sapphire jet engines developing a combined thrust of 16,600 pounds.



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**BEER FOR "THE PROFESSOR"** at the keyboard is set at his left on a stainless brass plate. His cigarette can't burn the keys. They are of double-thick plastic and are fireproof.

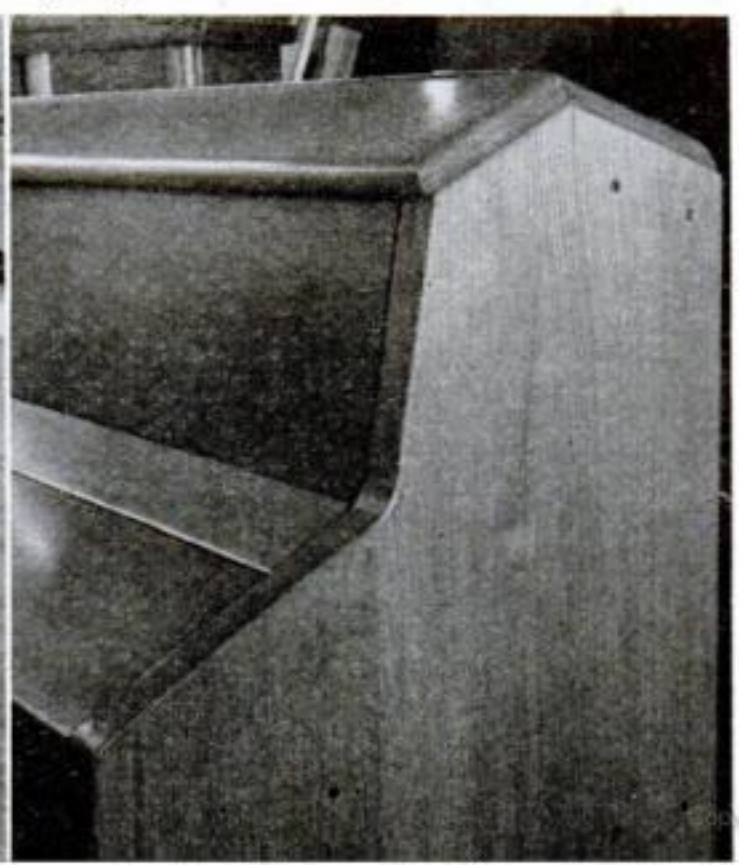
# This Piano Can Play Rough

PUT an ordinary piano in an Army, Navy or Air Force club and it soon gets burned, stained, strained and booted into a state of near collapse. From its experience reconditioning hundreds of pianos that had become delapidated in this way, the Lambert company of London, England, has devised the odd-looking new model shown on this page. The novel instrument slyly outwits careless music lovers who would set their beer mugs down on its top. It defies them to burn it with their cigarettes and is well fortified against rhythm-conscious pianists who beat time with their boots.

**MORE VOLUME** is quickly provided by sliding open a panel above the pedals. British servicemen haven't hesitated to kick holes in older pianos to get more sound out of them.

**NO STAINS ARE POSSIBLE** on the unusual new Lambert piano, which has a cellulose finish. And a man couldn't set down a glass anywhere on its sloping surfaces if he tried.



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**MR. & MRS. HARLOWE ZINN** in their seven-passenger 1918 Stanley Steamer. The car weighs 4,600 lb. In 1918, it cost $3,100. Wire wheels were $100 more.

# His Stanley Steamer Is Only 2 Years Old

***The day that the reborn antique rolled down the street under its own steam was a big one for this engineer.***

**By Gardner Soule**

THIS story could be told in 19 words: Like millions of other Americans, Harlowe Zinn bought a used car, fixed it up and now drives it around.

But the used car that he bought was a 1918 Stanley Steamer.

He bought it in December, 1949.

"I thought I could have it in shape in no time," says Zinn, a mechanical engineer who has tinkered with cars for 30 of his 42 years.

But it took him several weeks just to chip away the rust, and 10 months of back-breaking work to make the chassis ready to run.

When Zinn did take his first ride in the chassis—in October, 1950—it was the day his steamer was reborn. That makes it two years old next month. And Zinn says now of that first ride:

"It was the biggest day in my life."

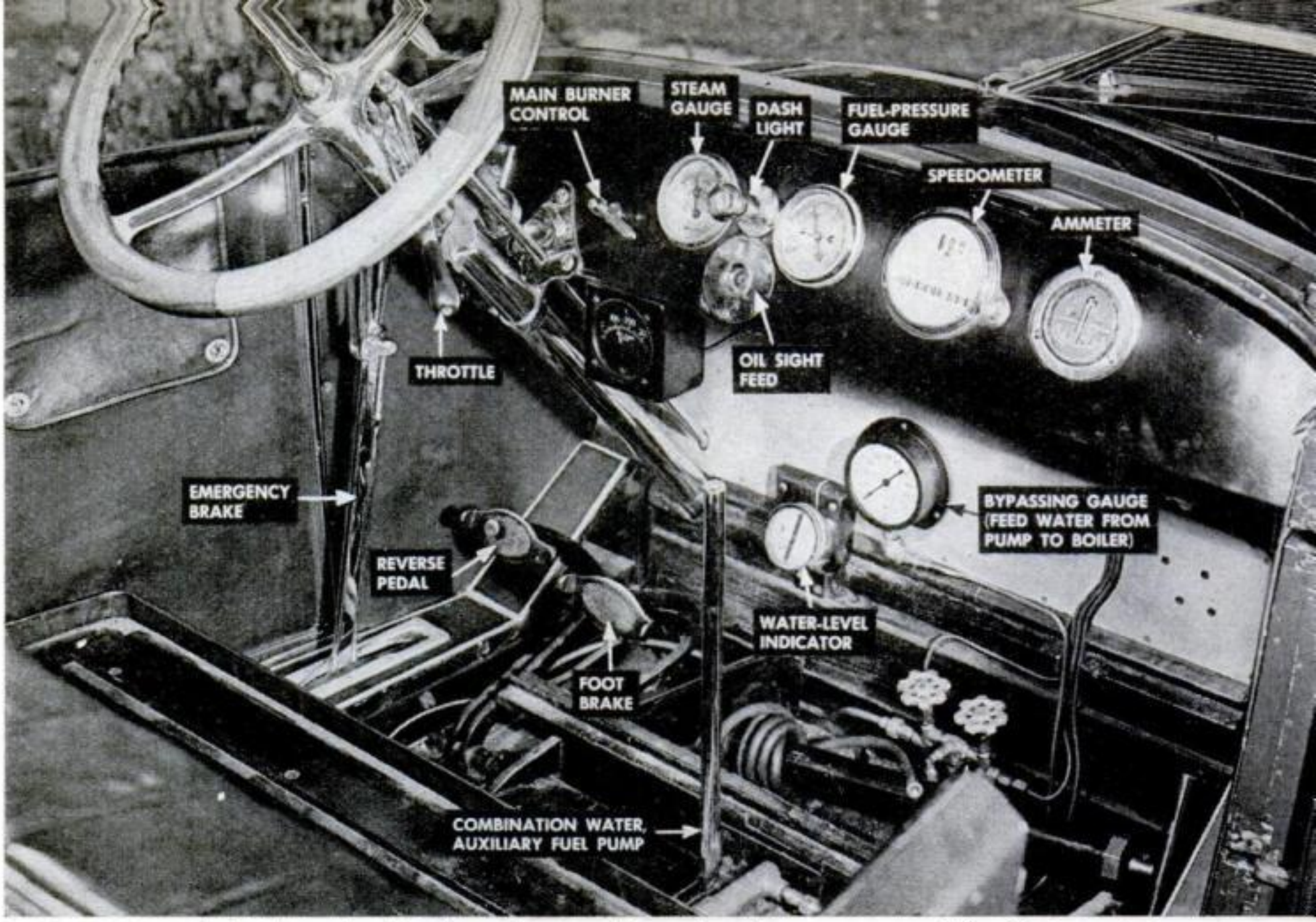
### *She Ain't What She Looks to Be*

The steamer looks like a gasoline buggy, but about all the two have in common is that both run on four wheels.

Under the steamer's hood, there is no engine. Instead, there is a boiler, inside of which water is turned into the steam that propels the car. A burner right under the boiler provides the necessary heat. The boiler is drum-shaped, 23 inches in diam-



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**DASHBOARD** and what's under floorboards are shown here. Klaxon horn button (not shown) is under the reverse pedal. Light switches (not shown) are at left on dashboard.

eter, 14 inches high and 300 pounds in weight.

Zinn put a new boiler into his car. He had to lower it into its cradle by chain hoist, then line it up with the piping and steam connections. This was one of the shorter chores. It took Zinn a week.

### *Tubing, Tubing, Everywhere*

Yards and yards of tubing carry water, steam and fuel all through the insides of a Stanley. Tubing carries water from the water tank (underneath the car) to the boiler. Tubing carries steam from the boiler through the throttle valve through superheating coils and back to a simple steam engine (under the back seat). More tubing carries fuel from the fuel tank (where your gas tank is) to the burner (under the boiler). There is lots more tubing. It twists and turns, up and down, in and around, behind the dash, under the car, around the boiler.

All the tubing has to be in place, open and functioning. Much of the tubing on Zinn's car had split. Zinn made careful sketches, took it all out, put some back, and in his workshop cut, bent and flared new tubing to replace more. This took weeks.

When he turned to the engine, Zinn took the casing off, adjusted the bearings and crossheads and saw to it that everything was clean and back in place.

There were dozens of other tasks. After 10 months of work, Zinn thought the chassis would run and he got ready to start it.

When Zinn let fuel from the main fuel line into the burner, there was a roar. Later, he learned the roar is normal when the burner is cold and you let into it as much fuel as he did. But then he wasn't sure what was going to happen.

Alarmed neighbors arrived.

When Zinn tried to work up steam, the steam poured out in clouds because he hadn't hooked up the exhaust connection.

More alarmed neighbors arrived. So did Mrs. Zinn, a charming brunette, who by then had learned to take almost anything in stride except steam billowing over her home.

But the steam this time was a sign that things were right—not wrong. Zinn had never driven a steamer. He had, however, learned by heart the function of every part because he had handled every single part



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**BOILER,** the white, drum-shaped object with dark top, produces the steam that powers the car. Stanley boilers never did explode, despite rumors you may have heard about them.

of the chassis and engine as he restored them.

Zinn, his wife and their son Bobby climbed aboard the chassis and rode around their home town, Upper Montclair, N. J.

It was so much fun that Zinn allowed himself four or five short rides late in 1950 before he got busy on the car's body.

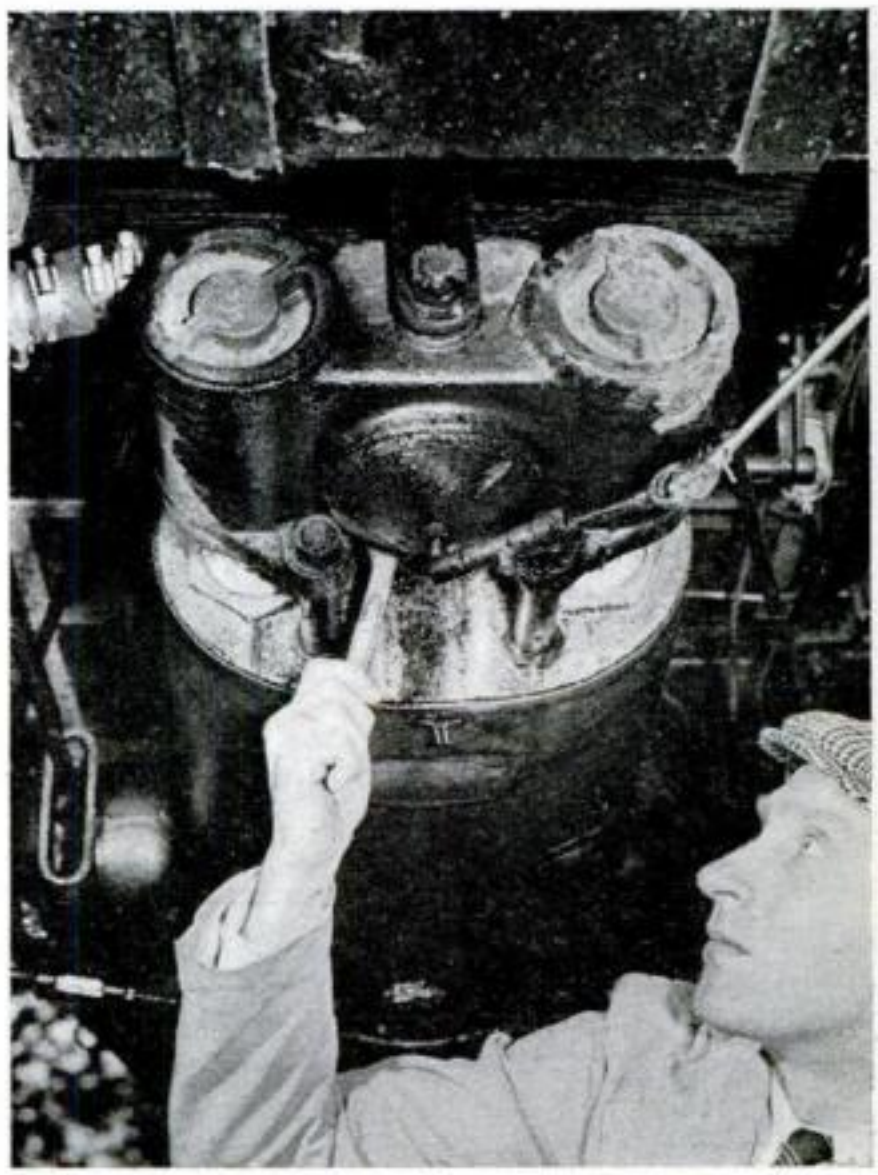
### *Only the Beginning, Folks*

Now he had to fit pieces in to replace pieces that had rusted out completely, sandblast fenders and other parts that could be taken off, and top off with what he calls the "interminable" job of priming, wet-sanding and finishing. Zinn put on six coats of a lacquer primer and four of colored lacquer, and rubbed down each of the coats by hand.

Actually, it took him March, April, May and June, 1951, to do the "interminable" job.

Zinn had the top made and the front seats recovered, and he had the boiler wrapped up in four layers of piano wire to strengthen it. Otherwise he did all the work.

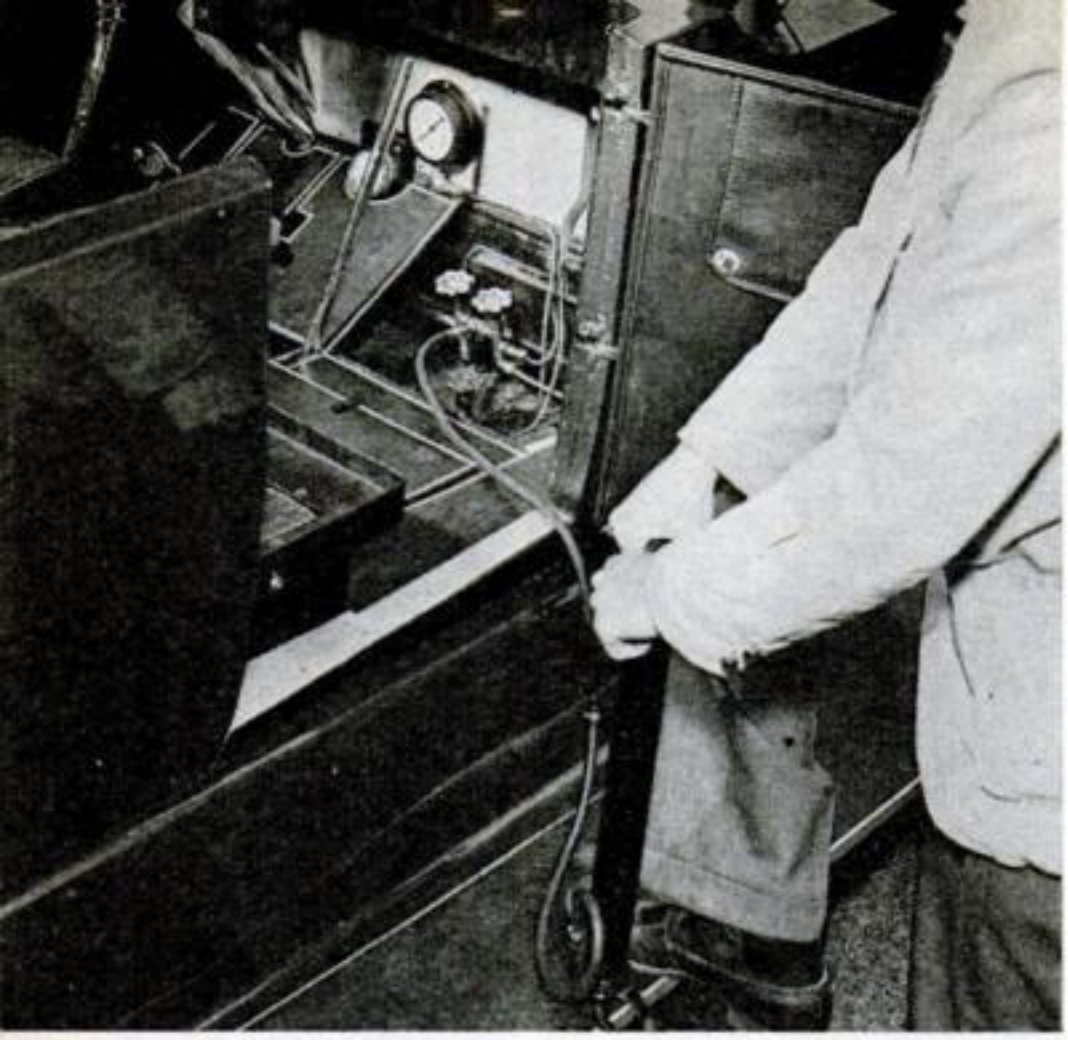
By October, 1951, 12 months after the first ride and 22 months after Zinn received



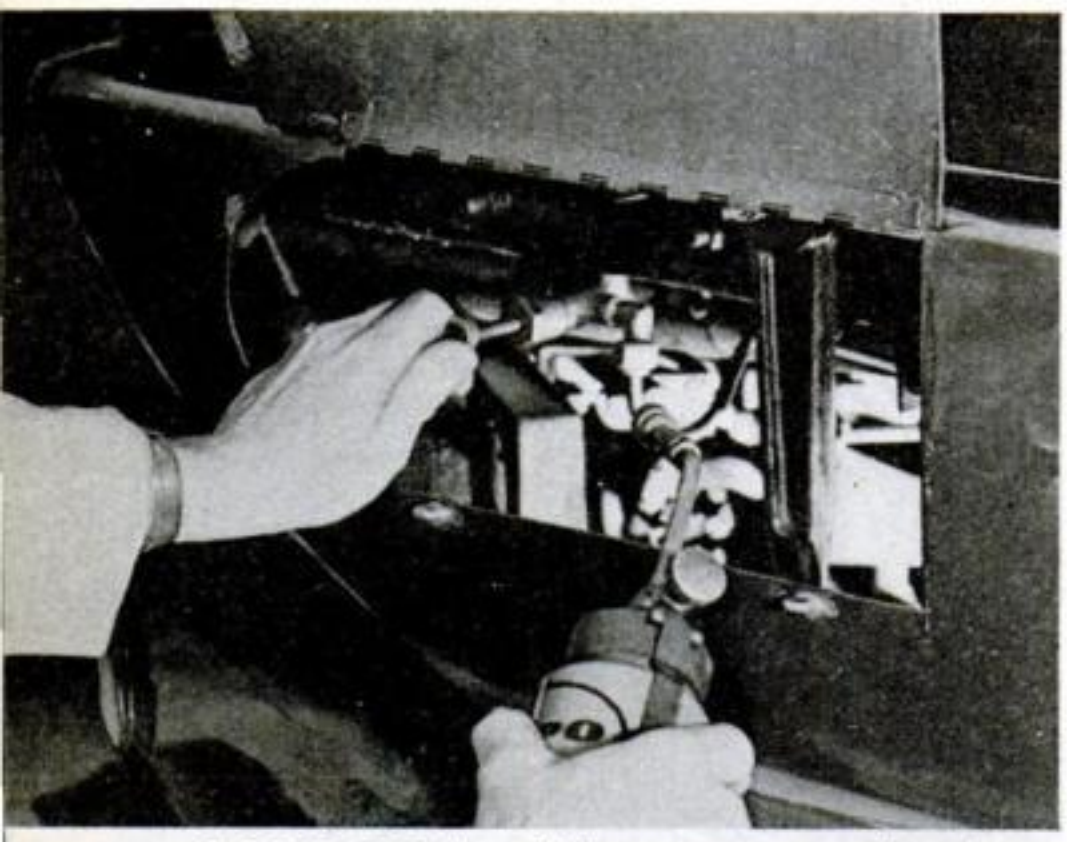
**SIMPLE ENGINE** under rear seat has 13 moving parts. Engine is two-cylinder, four by five, slide-valve type, double-acting. Engine, differential, are in oiltight housing.



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**IT TAKES ZINN** 30 minutes to start his Stanley, 20 if he's in a hurry. Procedure is shown in photos in this column. First step (above) is to pump air by hand into the pilot tank.



**SECOND STEP** is to light propane torch and use it to ignite pilot light (that's what's happening here). After pilot light burns for a while, Zinn turns on the main burner.

**TO WARM UP ENGINE,** Zinn jacks up drive wheel, as do many Stanley owners, before he starts car. Nonskid tires, 34 by 4, on demountable rims, take 60 pounds of air.




the steamer, the car, gleaming in gunmetal gray, was ready for a big test. On October 13, 1951, Zinn drove to Devon, Pa., for a major antique-automobile show. From Devon he returned with a covered silver vegetable dish with an inscription that reads, "First-prize Class S, Antique Automobile Club of America." S stands for steamer.

The Stanley cruises now at about 25 to 30 miles an hour. Zinn thinks he could get it up to 60, but he doesn't plan to try. "I want to preserve this car, not break anything," he says.

### *120 Miles to a Tankful—of Water*

He gets about 110 to 120 miles on one tank of water, 12 to 13 miles to a gallon of fuel (kerosene and non-leaded gas mixed). The Stanley gives him a quiet ride. An occasional hissing of the burner is the only noise.

To drive, he uses (1) the steering wheel, (2) the throttle on the steering-wheel column, (3) the right-foot pedal to brake and (4) the left-foot pedal to reverse. There is no gearshift. In this way, Stanley Steamers anticipated post-World War II gearshift-less cars by 50 years.

Zinn's wife, Marjorie, incidentally, has never driven the steamer. It isn't that she's afraid that a 34-year-old car might break down; she simply has her own 1947 Cadillac.

### *Get a Horse, Mister!*

The Zinns by now are used to the comments (spoken and unspoken) that people make when they see the car. Garage mechanics display awe or reverence when Zinn drives in. Passers-by stare. "Of course," remarks Marjorie, "kids say, 'Get a horse.'"

Drivers are inclined to pass the steamer, Zinn has noticed, then realize it looks different and cut in closely in front of him as they peer at it.

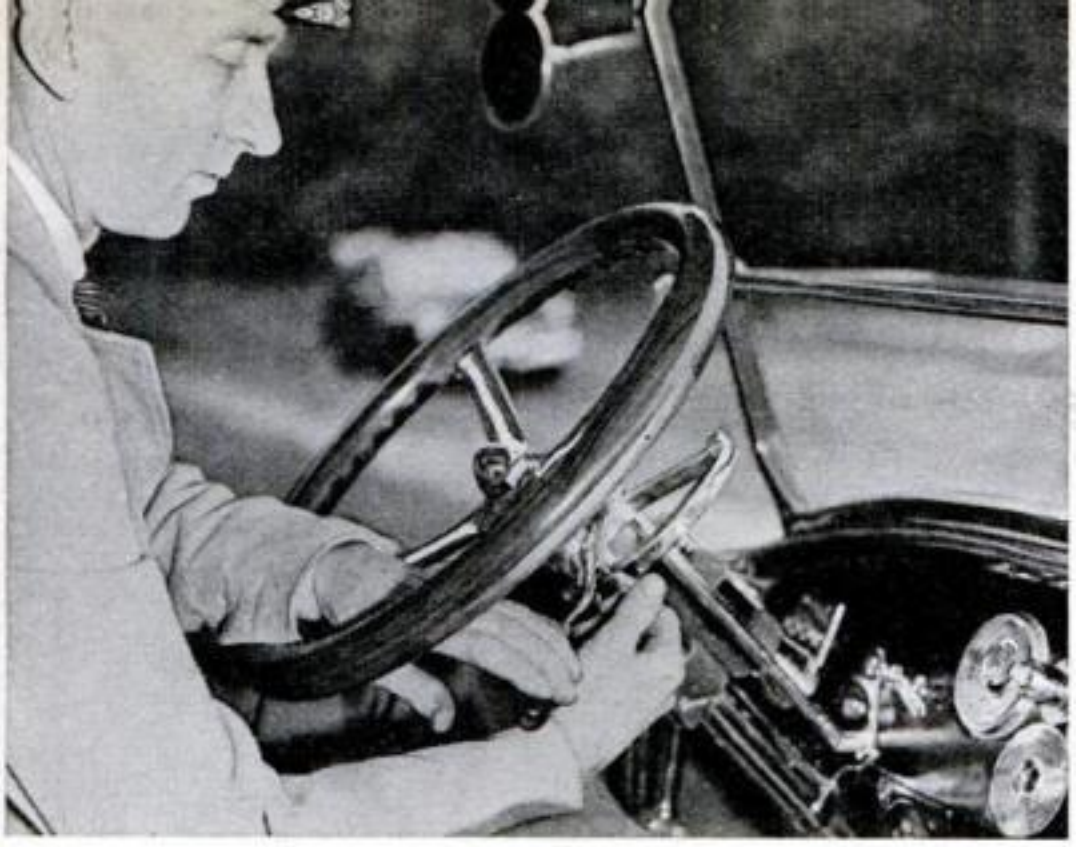
There is a good deal of maintenance that Zinn must do. Those 746 tubes inside the boiler, for instance, must be wire-brushed out occasionally—a job that a gasoline-car owner does not have.

Most of the tubing in the car is copper, and it must be polished. This takes a night or day out of most of Zinn's weeks.

And then in the winter all tubing must be blown out by compressed air else water will freeze and burst it. Some tubes are so small a drop of water freezing can split



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**THROTTLE, a lever on steering-wheel column, regulates speed of steamer. Zinn locks throttle when parked, unlocks it here. Car did not have mirror in 1918; law requires one now.**

them open. Zinn last winter missed one tiny tube. It burst.

Besides all this, Zinn must mix the fuel himself—as fast as he uses it up.

### *Puts in Every Detail*

Zinn restored his steamer with careful attention to insure its being exactly the way the 34-year old car appeared when it was new. Almost every detail—including the spare wheel at the back, the upholstery and every gauge on the dash—is as it was then.

Zinn is chief engineer of the Flintkote Co. (roofing, insulation, etc.). He is a pillar of his community, with a beautiful suburban home and a Ford station wagon that he drives to work. He had yachting as a hobby —till December, 1949, that is. What makes a man like Zinn buy an antique automobile and spend countless and endless hours restoring it? Why did he do it, anyway?

George Overbury in *The Story of a Stanley Steamer* says that a man does it because of the creative urge. There's something to it in Zinn's case anyhow.

When he was 16, Zinn restored a motorcycle. He bought it for $2 from a junkman and carried home the pieces in two bushel baskets. He had the motorcycle running in several weeks.

"I thought I could make almost as good time with the Stanley," he laughs.

### *The Hair-Curling Question*

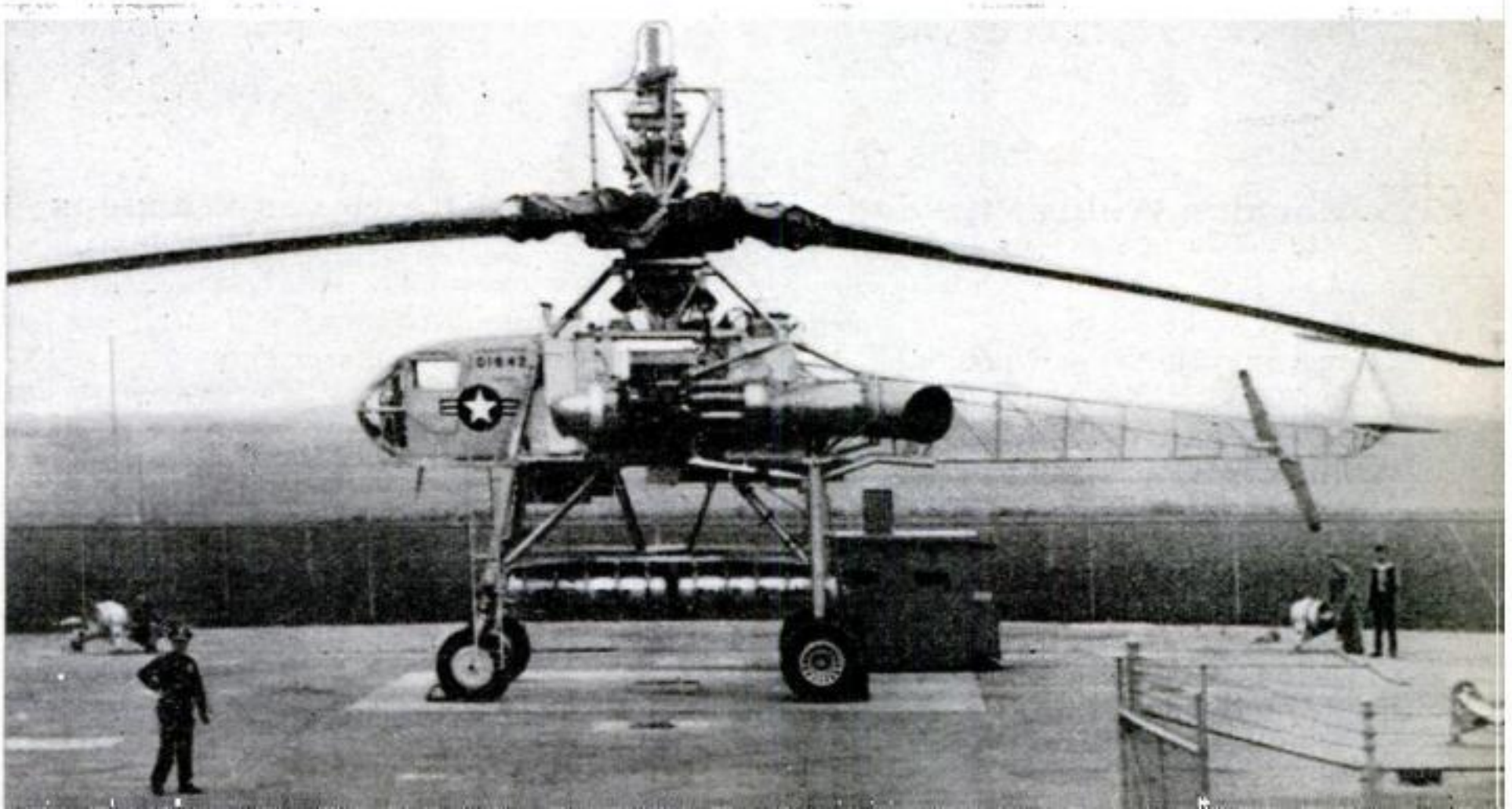
Today, after that 30 months of labor on the steamer, Harlowe Zinn loves to answer questions about his car. There is just one question that can upset him.

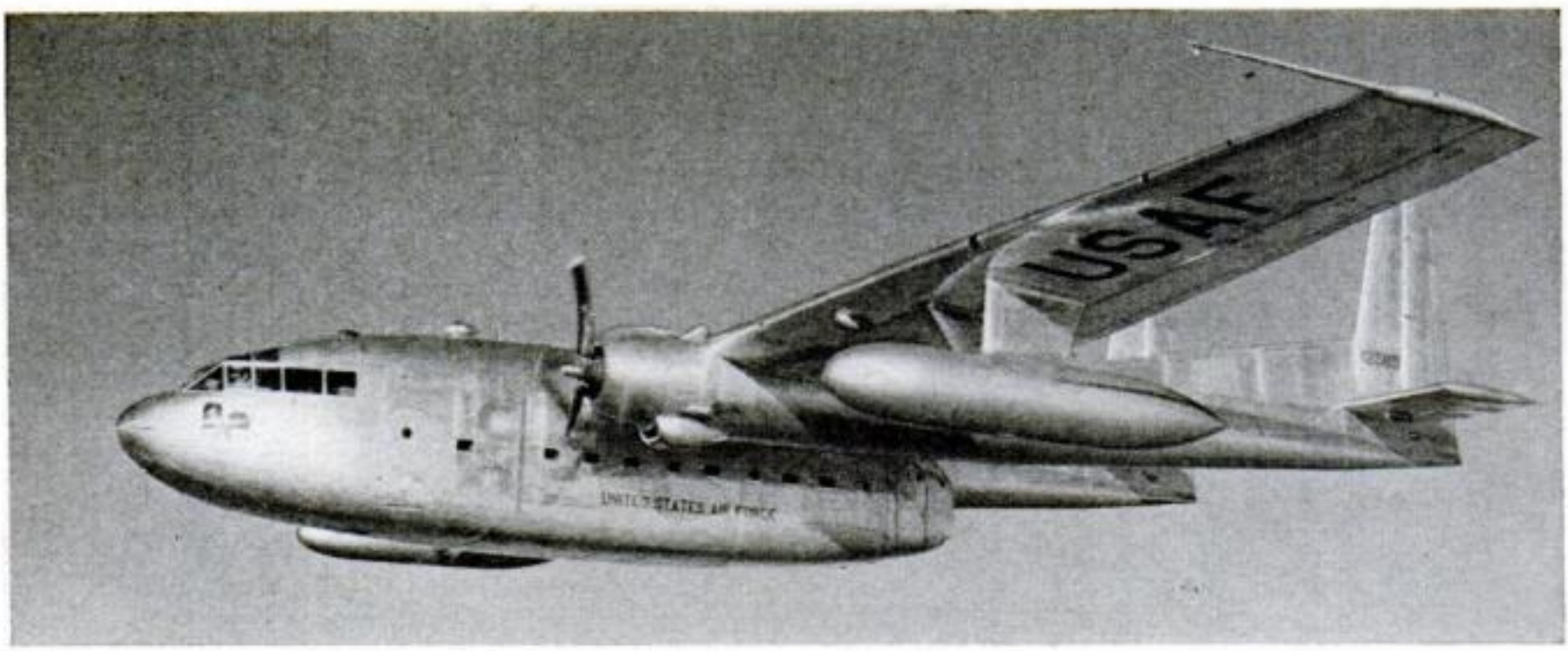
It is the question that antique-automobile owners use on each other as a pet gag. But when it comes from ordinary citizens, it can curl Harlowe Zinn's straight hair.

"How on earth," people are forever asking him, "did you ever find a steamer in such *good* condition?" END

## Helicopter Picks Up Cargo Like a Lumber Lift

THE jet-powered XH-17, Howard Hughes' new helicopter, has moved out of its hangar for ground tests. Designed for the Air Force for short-range moving of heavy military equipment, it will straddle and pick up cargo like a lumber lift. Two GE turbojets power the craft, supplying gas pressure through ducts leading up the rotor shaft and out to the blade tips. The 'copter appears to weigh at least 10 tons, stands about 40 feet high and spans about 110 feet from blade tip to blade tip.





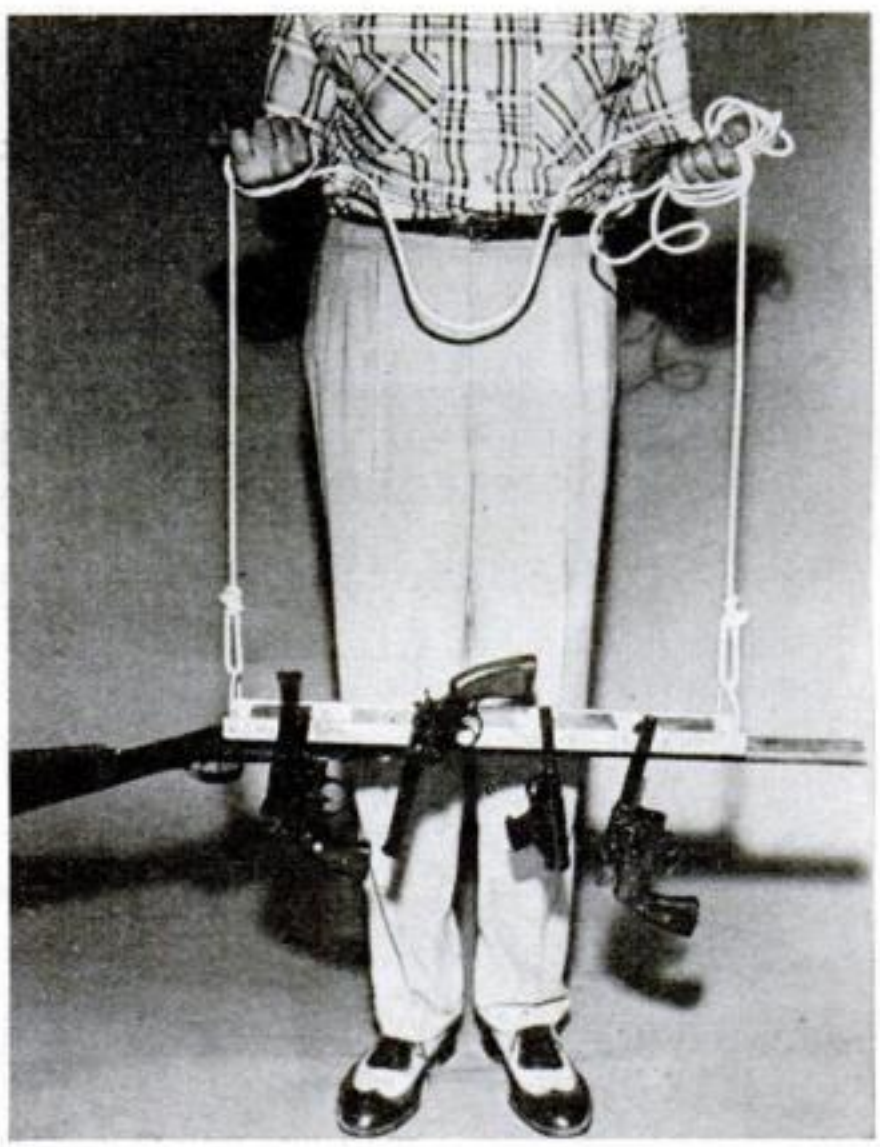

## Newest Flying Boxcar Carries Its Gas on the Outside

THE newest member of the Flying Boxcar family, the Fairchild C-119H, lugs all its fuel in pods beneath the wing. Big brother of the C-119C, its wing span has been extended to 148 feet. It can carry 27,200 pounds of cargo, take off over a 50-foot obstacle in 2,600 feet, land in 1,300 feet with 72-m.p.h. touchdown speed.



## Machine Welds Plywood Walls

PLYWOOD panels can be "spot welded" in place fast with the high-frequency electric gluing machine above. The machine produces a quick set in a number of small spots, and these "welds" hold the plywood to the furring strips while the rest of the glue sets normally. The gluing method eliminates exposed surface nails, makes better joints and permits use of thinner paneling. Wood Welding, Inc., Burbank, Calif., makes the machine.



## Magnet Retrieves Weapons

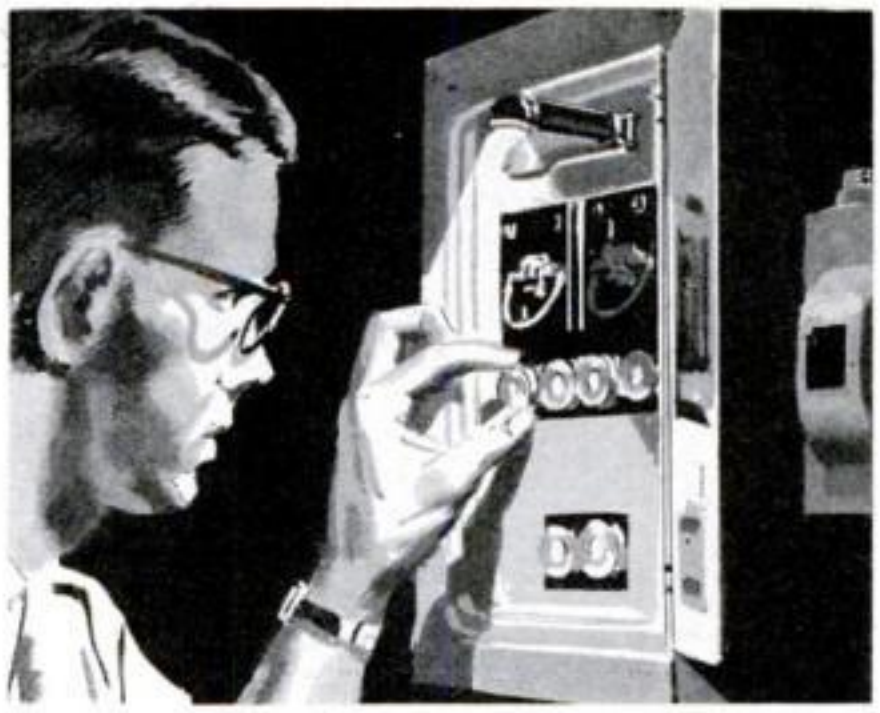
THE magnet above will help police retrieve guns and knives that have been tossed into rivers, crevices, deep wells and other hard-to-reach spots. Permanent magnets bolted together between two parallel steel conductor bars form the 13-pound unit. It can be lowered on ropes by one man and rocked back and forth to reach between stones and into other recesses. Made by the Miami Magnet Co., Miami, it is said to lift up to 1,000 pounds.



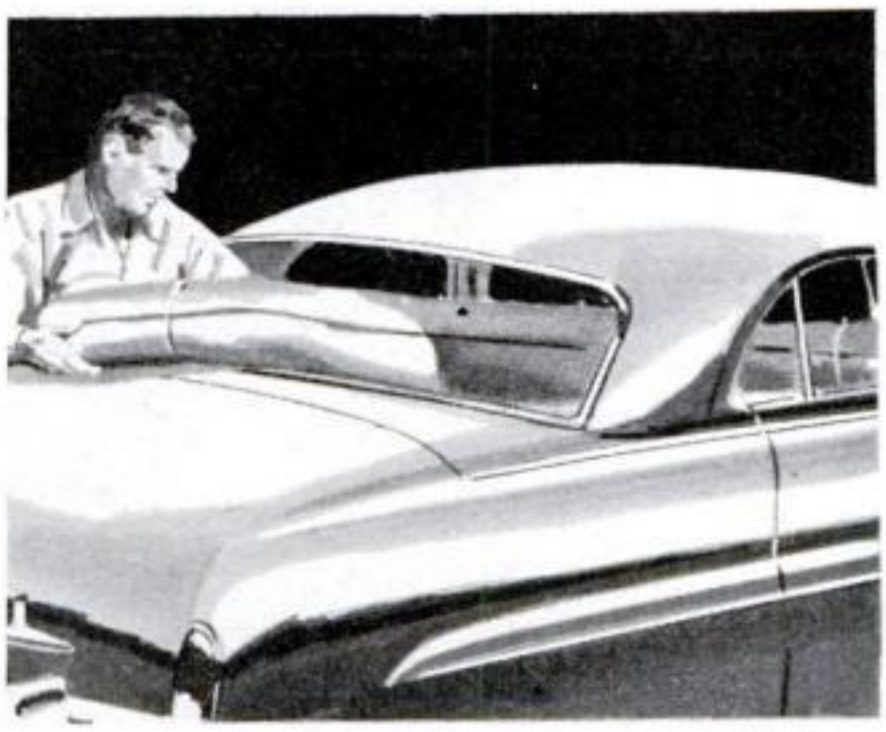
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# I'd like to see them make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



**A LIGHTED FUSE BOX** with a small battery-powered lamp built into it to eliminate hunting up a flashlight every time a fuse blows.—*Joe Schulte, Grosse Pointe, Mich.*



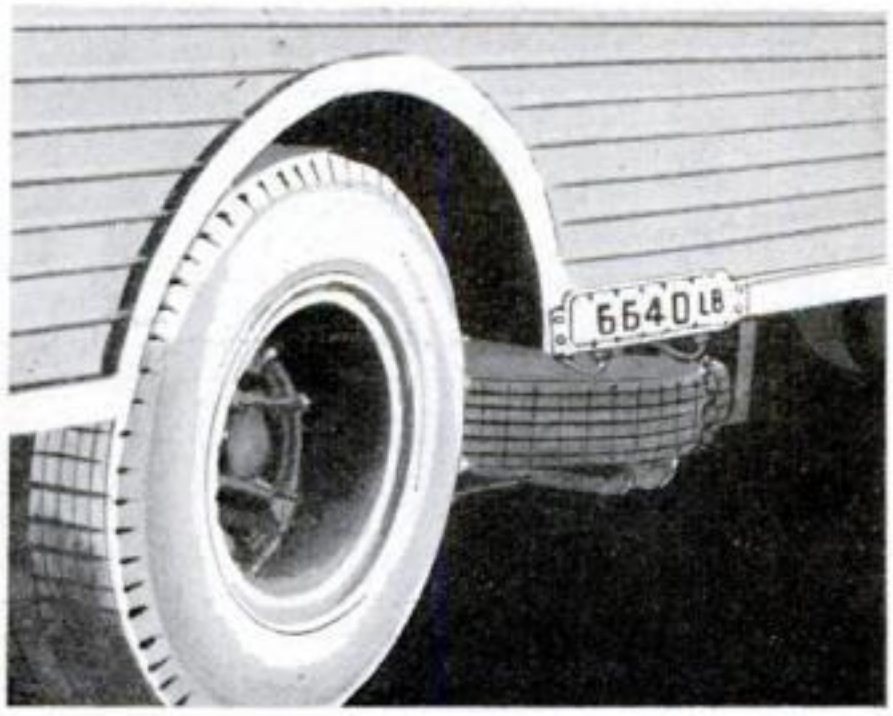
**A ROLL-DOWN WINDOW** at rear of car for better ventilation in hot weather. It would be useful, too, when transporting a long object such as a rug.—*Jerry Cox, Mascoutah, Ill.*



**SMALL POCKETS ON CHILDREN'S MITTENS** to hold their Sunday-school or lunch money. Pockets should close securely with snaps or zippers.—*Mrs. Ernest Miller, Lansing, Mich.*



**A HYDRAULIC SHOCK ABSORBER** for high-powered rifles. It would take care of the kick-back that produces a sore shoulder after a day's shooting.—*Robert Otto, Elkton, Ore.*




**TRUCKS WITH BUILT-IN SCALES** to prevent overloading, eliminate trips to scales and let consignee see weight of the load.—*E. E. Youngkin, Altoona, Pa.*



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# Cardboard Chair Put Together in 5 Minutes

***It weighs only 16 pounds, holds a ton and costs $20.***



**1** **EIGHT PIECES OF CARDBOARD**—an outer frame, four uprights, two seat braces, a back brace—will form chair. Time: 7:55 p.m.



**4** **SEAT FLAP** at front of chair is bent into place with slots straddling uprights.



**5** **SEAT BRACES** for center section are bent into U shapes and pressed over uprights.



**6** **BACK BRACE** is inserted behind last seat brace, upper slots are fitted over uprights.



**7** **SEAT AND BACK WINGS** are folded over the bracing and locked into place with tabs.



**8** **CUSHIONS** pad back and seat. They are spring-filled, covered with foam rubber.



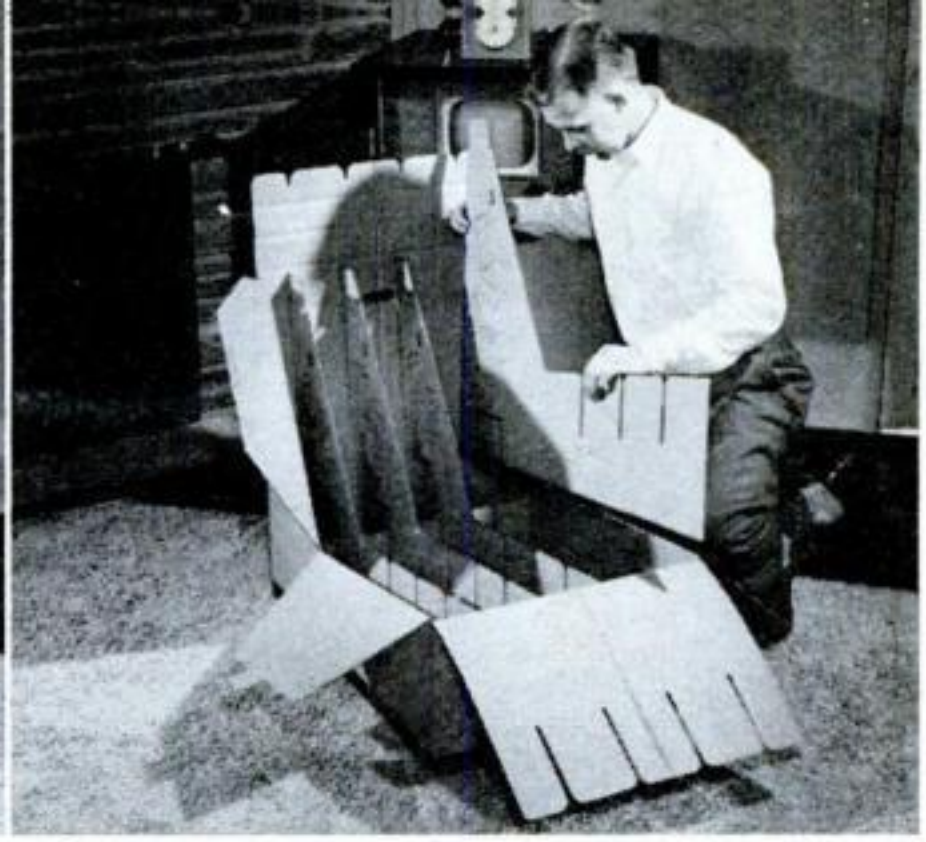
**9** **SLIPCOVER** is added and the job is done. No tools to put away, no mess to clean up.



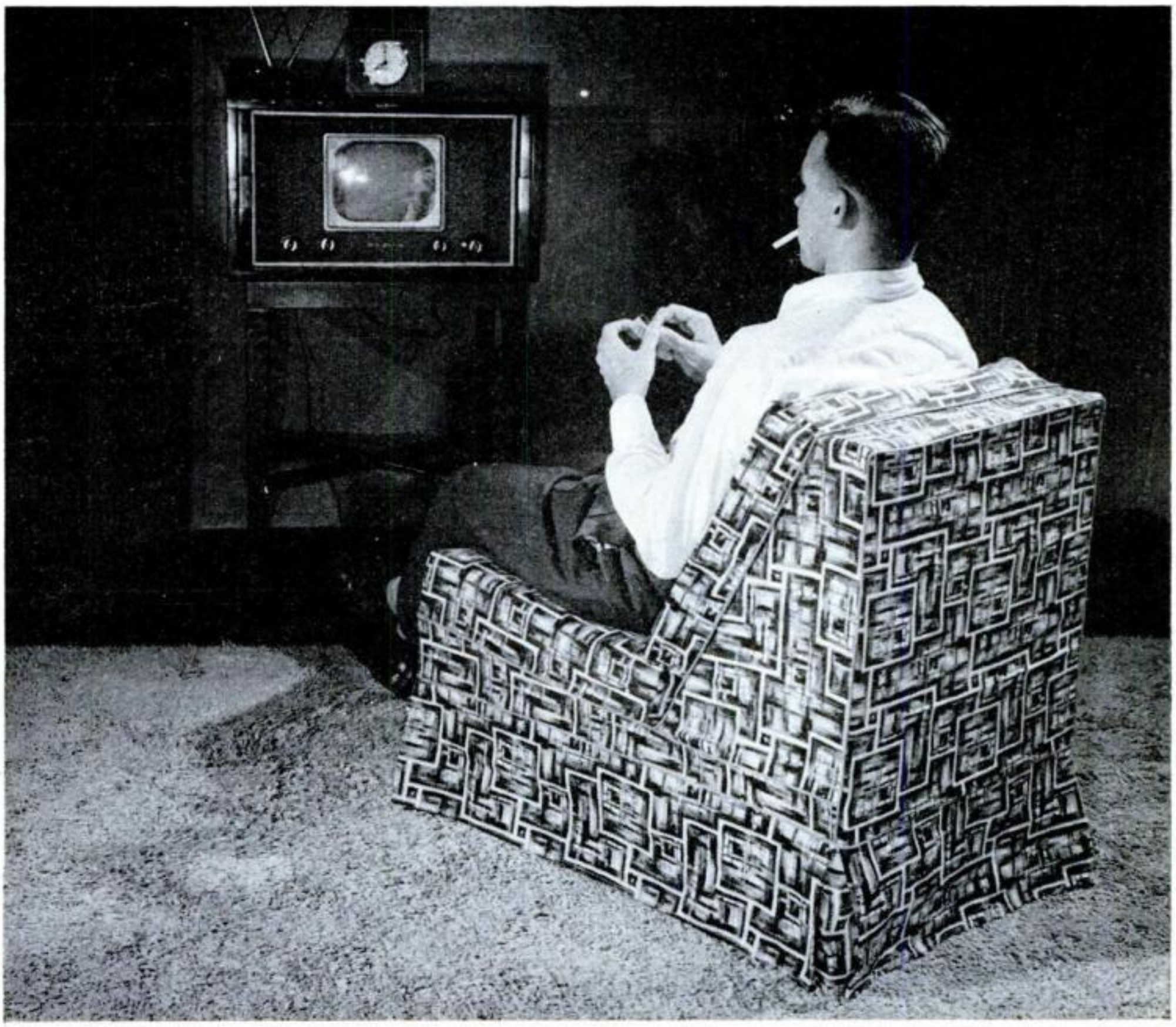
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**2 OUTER FRAME** is bent into shape. Flaps of base are locked together by slipping tabs into slits. Note slotted inner piece in base.



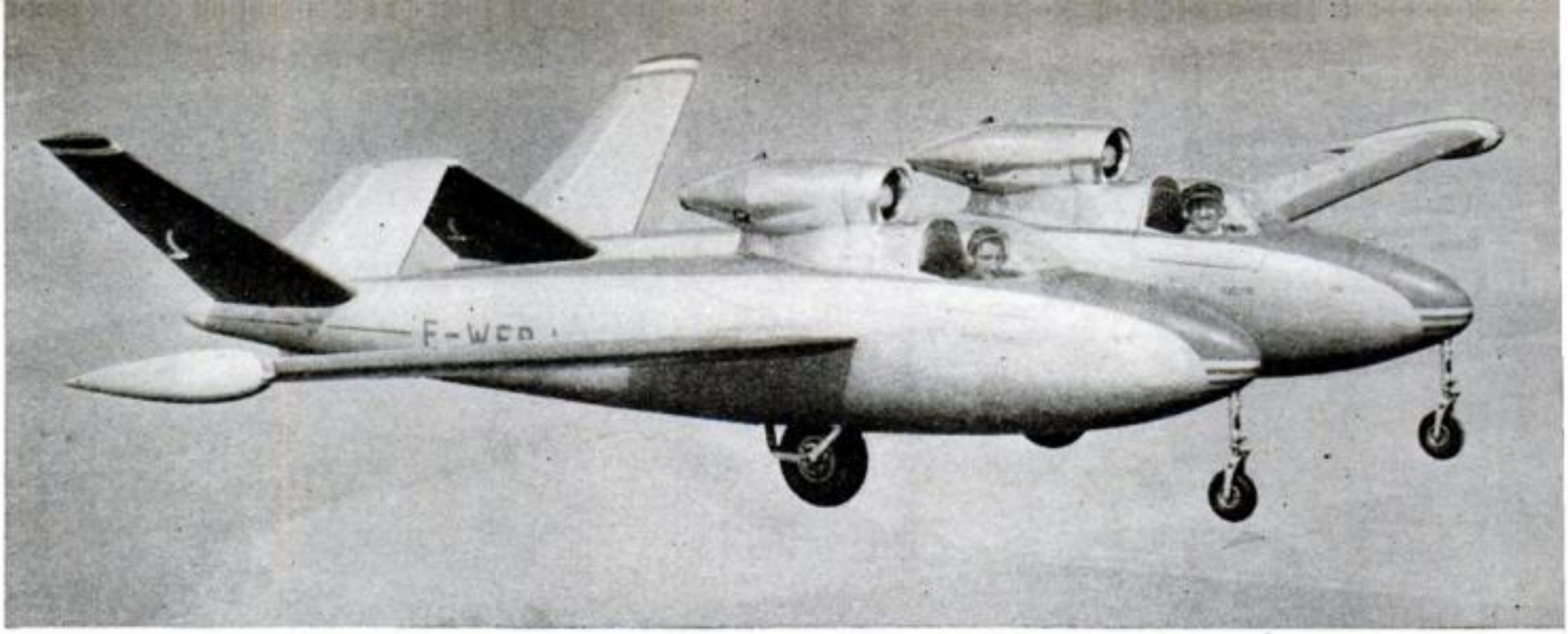
**3 CHAIR IS TURNED UPRIGHT** and slotted portion of base is bent upward to receive the four uprights which distribute weight evenly.



**10 EIGHT O'CLOCK AND THE CHAIR** is in use. Expenditure—five minutes' time and $20. Inventor Earl Dallas Smith says it will support one ton and that a 595-pound man can jump on it and it won't cave in. The Comfy Mfg. Co., 295 Fifth Ave., NYC, distributes it.



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**TWIN-FAN PLANE,** driven by new method of propulsion, is flown experimentally by French manufacturer. Plane actually consists of two mated monoplanes. Now see facing page.

# Fans in Tubes Drive

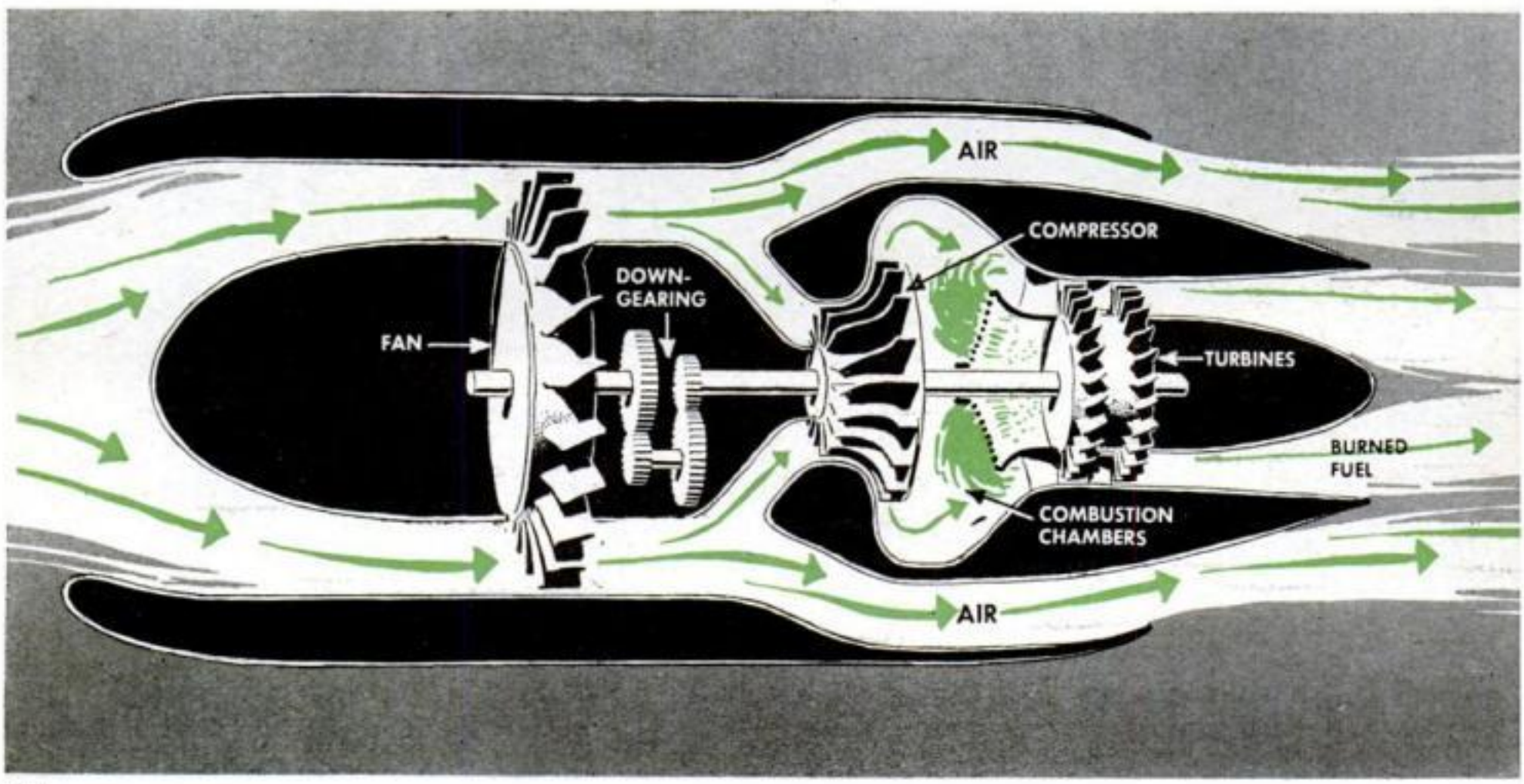
***Cruising at 400 to 500 m.p.h., they're faster than propeller planes,***

A NEW way to drive an airplane—using a fan enclosed in a tube—is being tried out in France by Fouga & Co. An engine turns the fan, the fan pushes air back through a tailpipe, and the plane is propelled by reaction to the stream of air.

The plane flies for the same reason that a regular jet airplane flies, but there the comparison ends. The jet emits a small volume of gases at high velocity. It flies fast fine, but at lower speeds hogs fuel. Its speed also makes it less maneuverable.

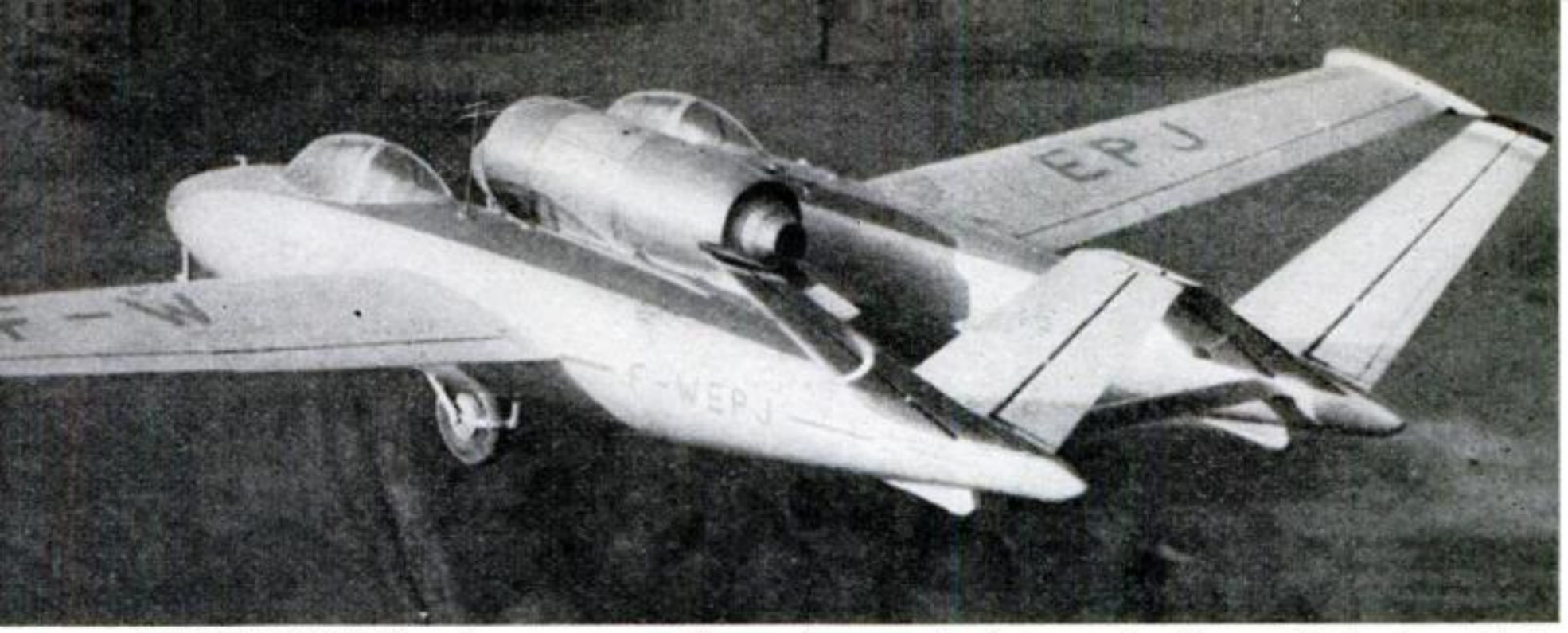
This new kind of propulsion, called the "ducted-fan engine," emits a big volume of air at *low* velocity. It flies slower than a pure jet but faster than a propeller airplane. And—here's the payoff—it gets more miles-per-gallon at 400 to 500 miles an hour than either a jet or a propeller plane.

Like the jet, the ducted-fan engine is a gas turbine. Unlike the jet, little of the volume of hot gases it generates is used






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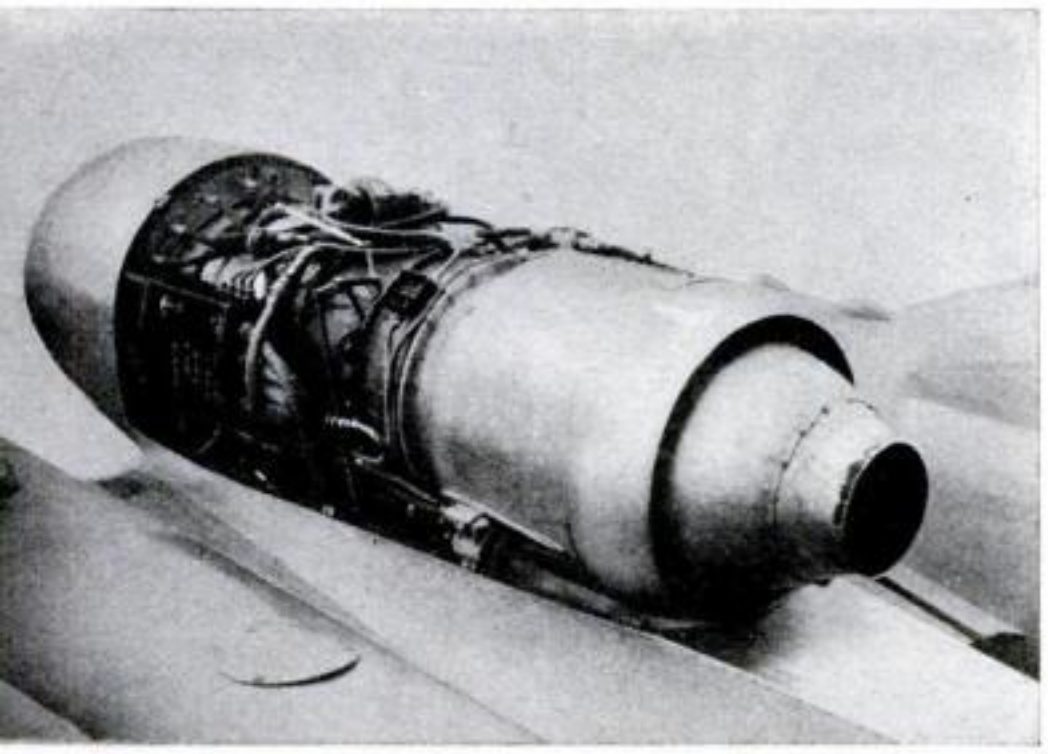
**SINGLE-FAN PLANE,** using same type of propulsion in similar mated monoplanes, mounts engine between fuselages. Both planes fly by reaction to air jet through tailpipe.

# These French Planes

***more maneuverable than jets—and will fly on less fuel than either.***

directly for propulsion. Some of the energy is used to whirl the compressor. The rest whirls the fan. The volume of air going out the tailpipe is seven times the volume of the burned gases.

The ducted fan is intended to fill the big vacuum in speeds between propellers and jets. The French company, experimentally flying both single- and twin-fan planes, sees them as ideal for small, privately owned transports. END



**DUCTED-FAN PLANE** has double tailpipes, one within the other. From outer pipe comes great volume of fan-generated air which does most of propulsion by reaction. Relatively small amount of propulsion results from inner pipe that vents gases burned in turbine.

## The Ducted Fan's Place in Aviation

**700 M.P.H.**



**PURE JET PLANE** can achieve speeds in excess of that of sound due to small volume of high-velocity gases exhausted through tailpipe of narrow diameter.

**450 M.P.H.**



**DUCTED-FAN PLANE** flies slower than pure jet but faster than propeller plane by exhausting big volume of low-velocity air through tailpipe of big diameter.

**300 M.P.H.**



**PROPELLER PLANE** flies slower than either jet or ducted fan but lands slower, can use smaller airports. It flies through displacement of air by propellers.



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# Auto Battery Powers Cars for Kids

***The same kind of motor that starts your car drives baby hot rods at a brisk walk.***



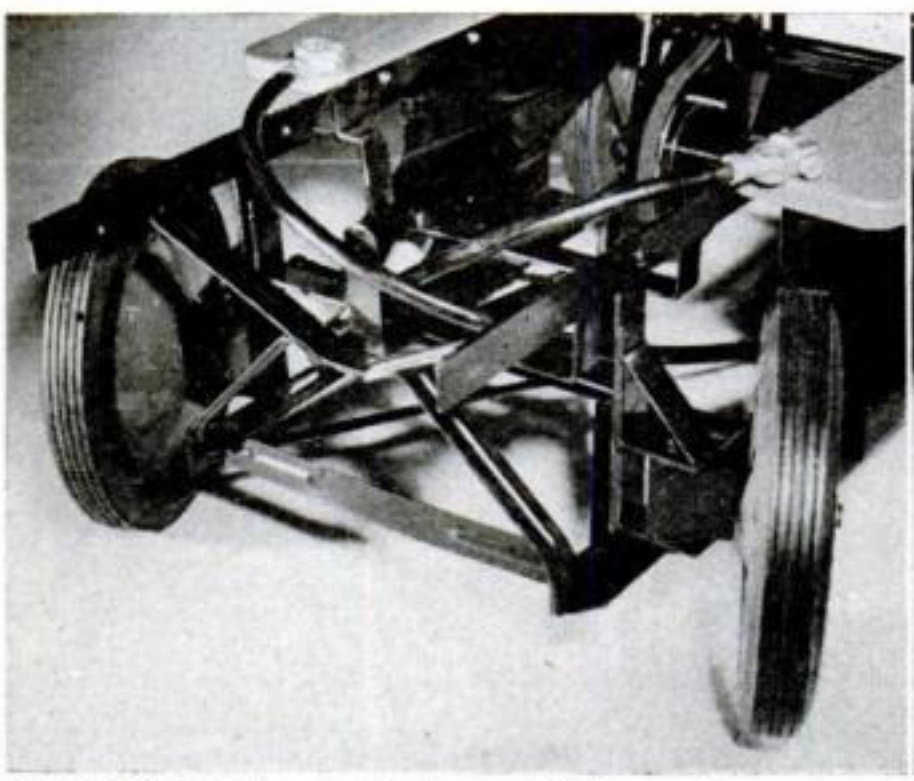

**MINIATURE TRACTOR,** driven by electric motor, runs on endless treads through power-fed rear wheels. It goes up a 45-degree slope.

A FELLOW who was so handy with his mitts in high school that he built an eight-tube radio set without a diagram is now building electric-powered cars for kids to play with.

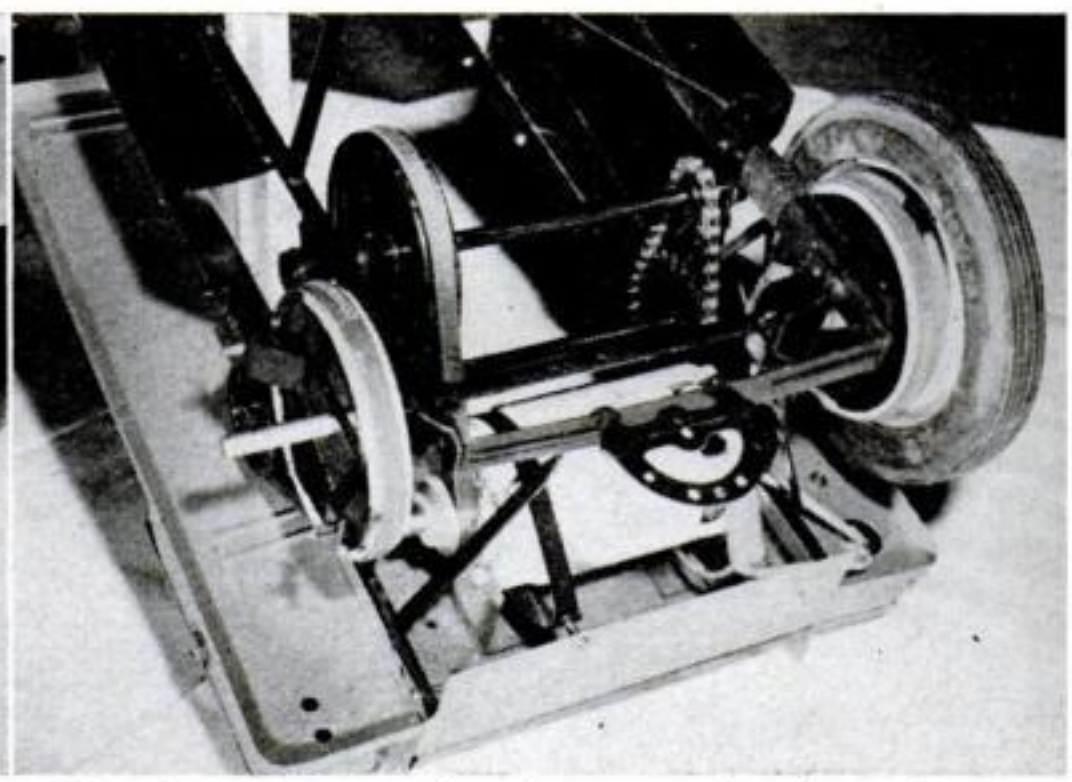
Detroit-born George Ford (no relation to Henry) calls his automobile for pint-size citizens the Powercar Junior. It runs on a storage battery. It reverses, as any automobile should. It has headlights, a tail light and brake. With an average-weight youngster at the controls, it will roll along on level ground at about the speed of a brisk adult walk.

Ford also makes an electric tractor in his factory at New London, Conn. Gearing gives it an amazing amount of power.

Ford's cars and tractors are powered by a modified Ford V-8 starting motor. Ford wanted to put a reverse on it, but was told



**CAR'S FRAME** is made from ⅛" metal stampings welded together. X-braced at four points, it weighs 20 lb. Complete car, battery excluded, weighs 90 lb., is 24" high, 40" long.

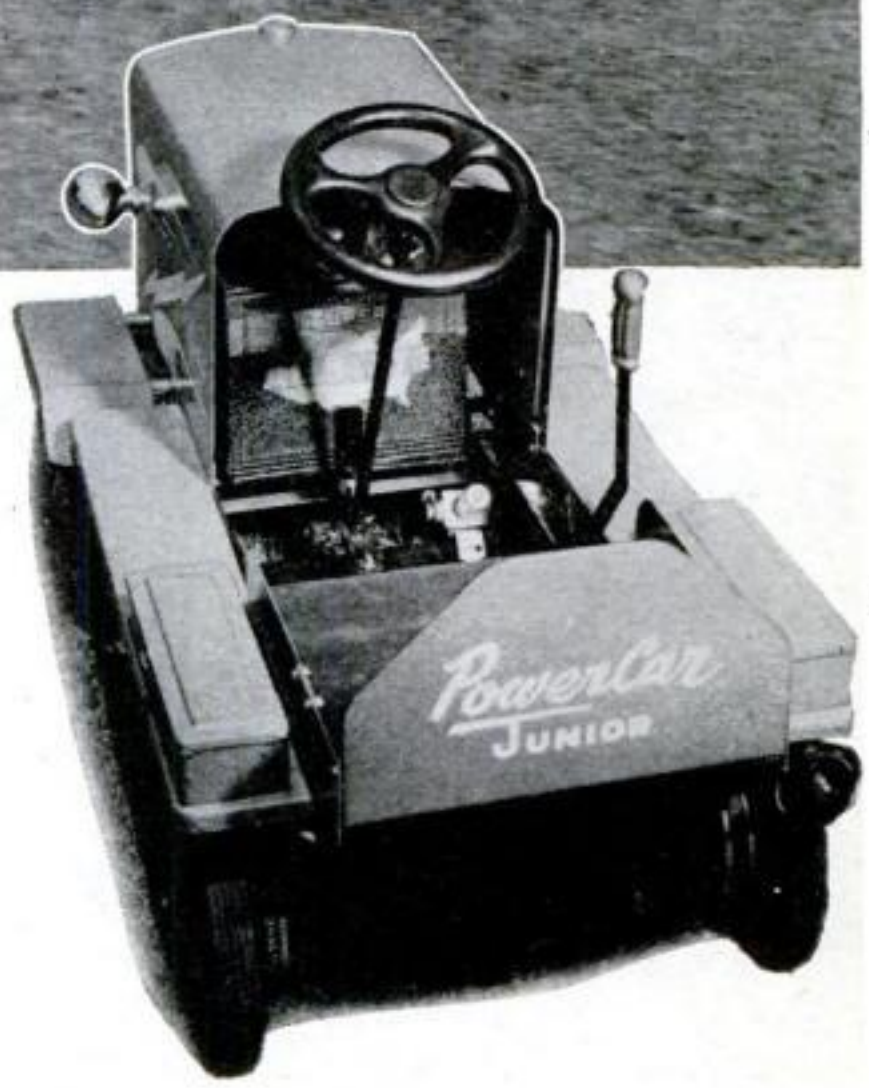


**DRIVE FROM MOTOR** has 3-stage reduction—from a pulley on motor to one on an idler, from a sprocket on idler to another on a second idler, thence by pulley to rear wheels.



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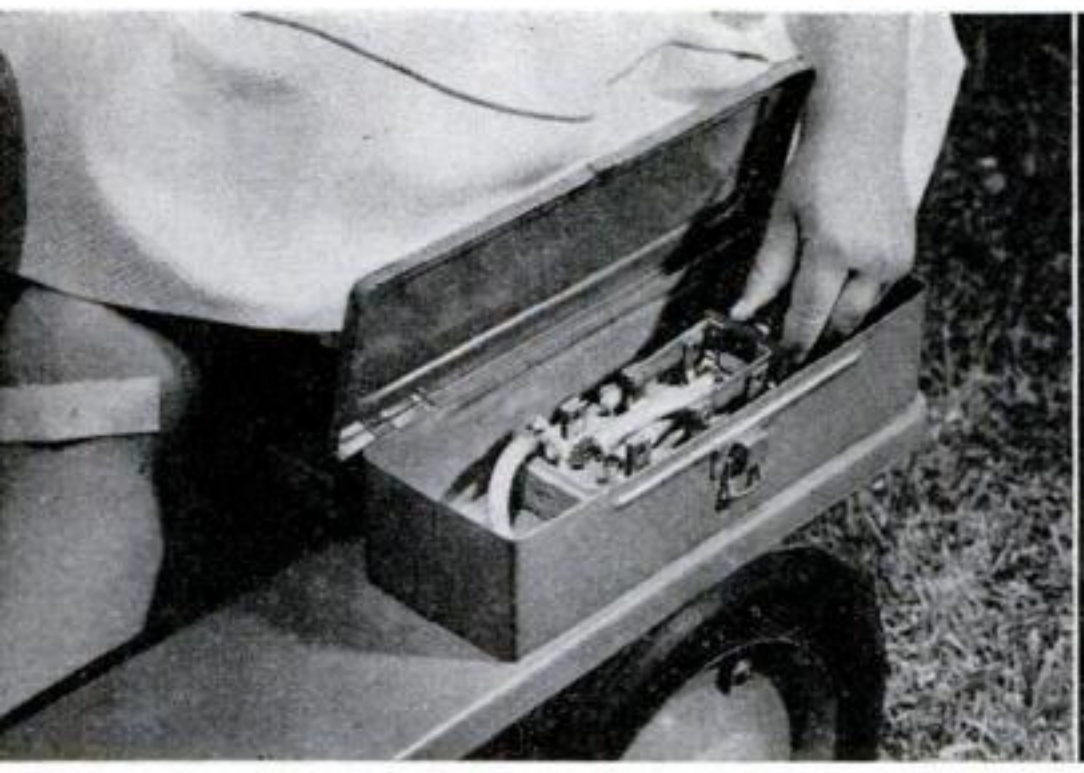



**PASSENGER TRAILER and wood dump truck can be hooked to car. Car retails for $109.50, battery for $15, and recharger, which works off house current, for $12.95. Hand brake stops car by friction shoe on right rear wheel.**

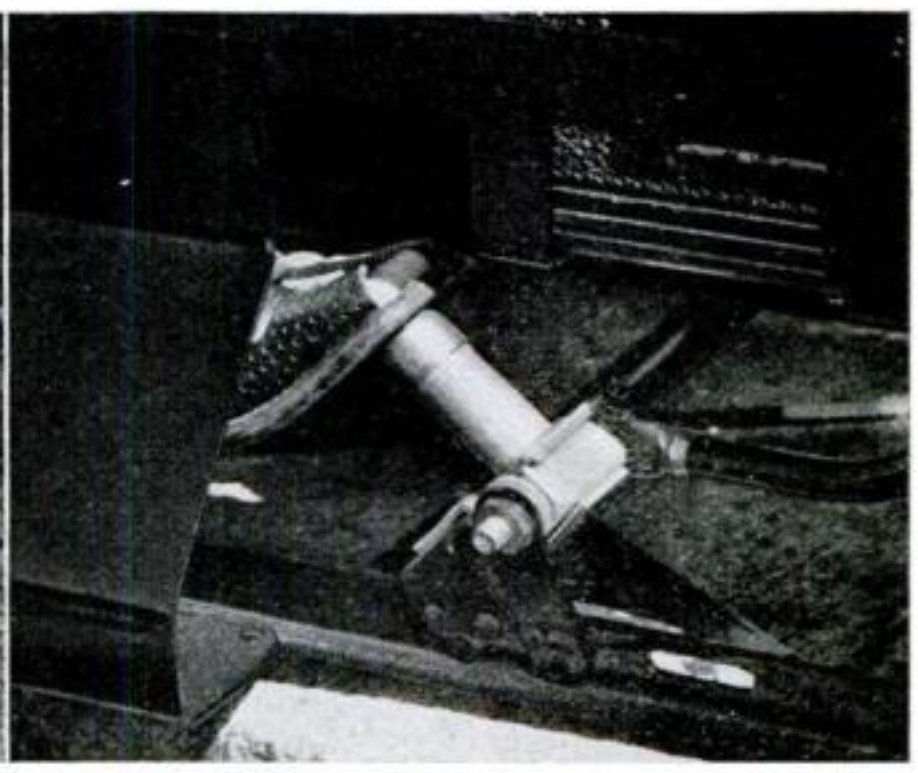
it couldn't be done. So he did it anyway.

To take the loads imposed, the regular bronze bushing bearings are replaced with needle bearings. An automobile starting motor gets only momentary, intermittent use. In the little cars and tractors, the use is intermittent but far from momentary.

The little cars and tractors manufactured by Ford are sold by Mystic River Sales Co., Mystic, Conn.—*Devon Francis.*



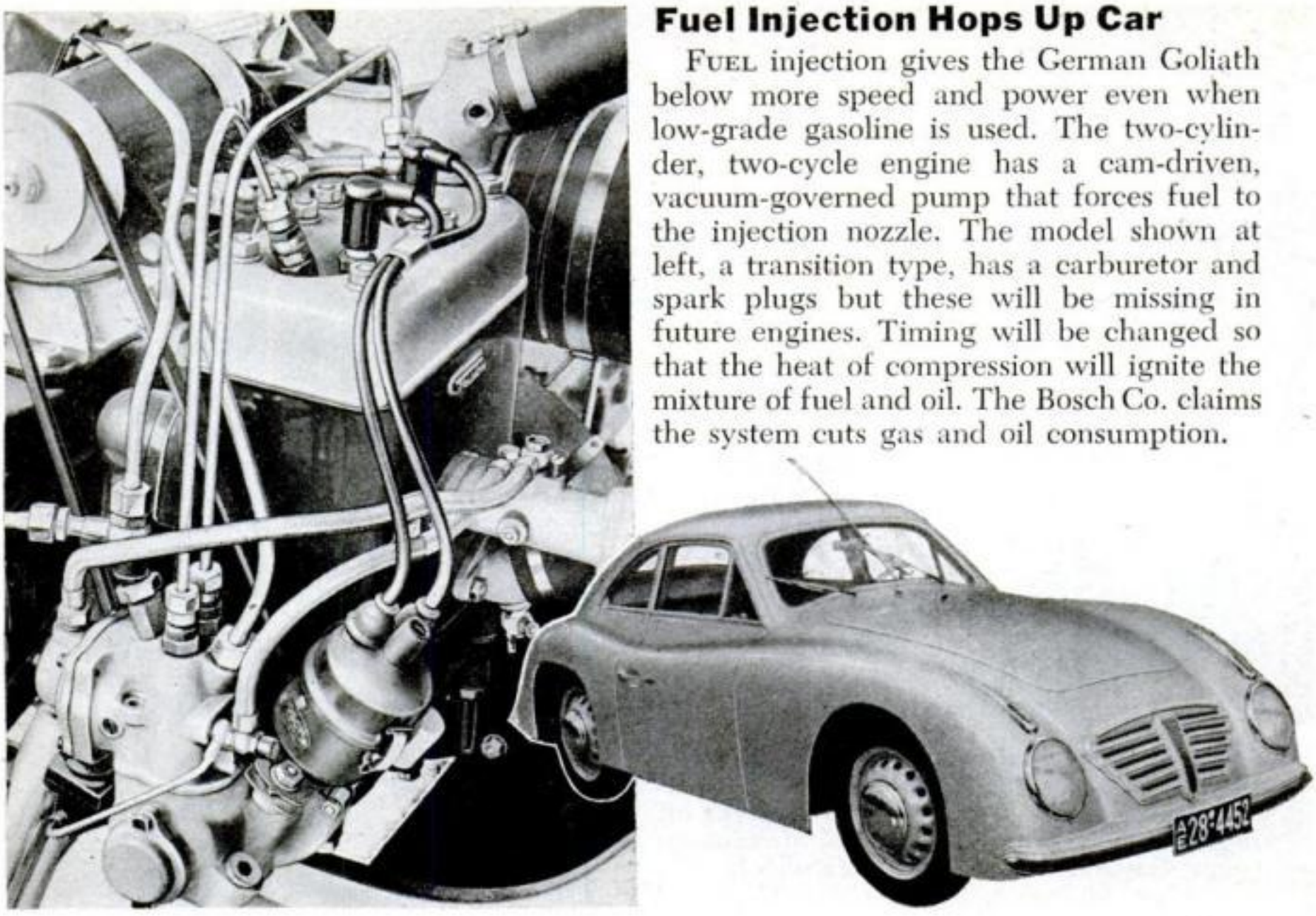
**REVERSING LEVER is double-throw knife-type switch on left rear fender. Small voltage used prevents shock. Motor is reversed by reversing polarity of fields.**



**FOOT SWITCH, a standard auto-starter push button, supplies contact between battery and motor to drive car. Car or tractor will run three to six hours, can be recharged overnight.**

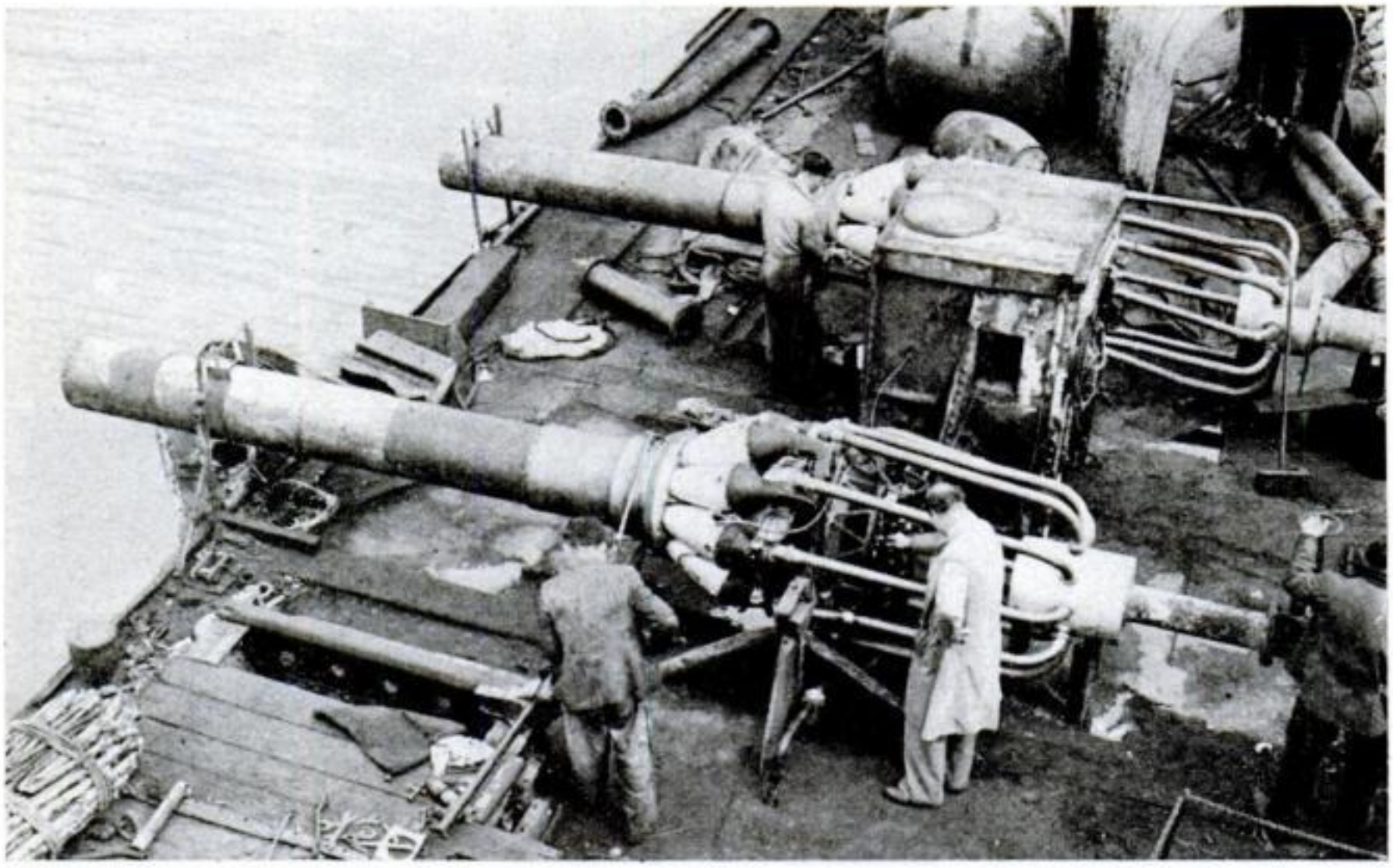


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## Fuel Injection Hops Up Car

FUEL injection gives the German Goliath below more speed and power even when low-grade gasoline is used. The two-cylinder, two-cycle engine has a cam-driven, vacuum-governed pump that forces fuel to the injection nozzle. The model shown at left, a transition type, has a carburetor and spark plugs but these will be missing in future engines. Timing will be changed so that the heat of compression will ignite the mixture of fuel and oil. The Bosch Co. claims the system cuts gas and oil consumption.



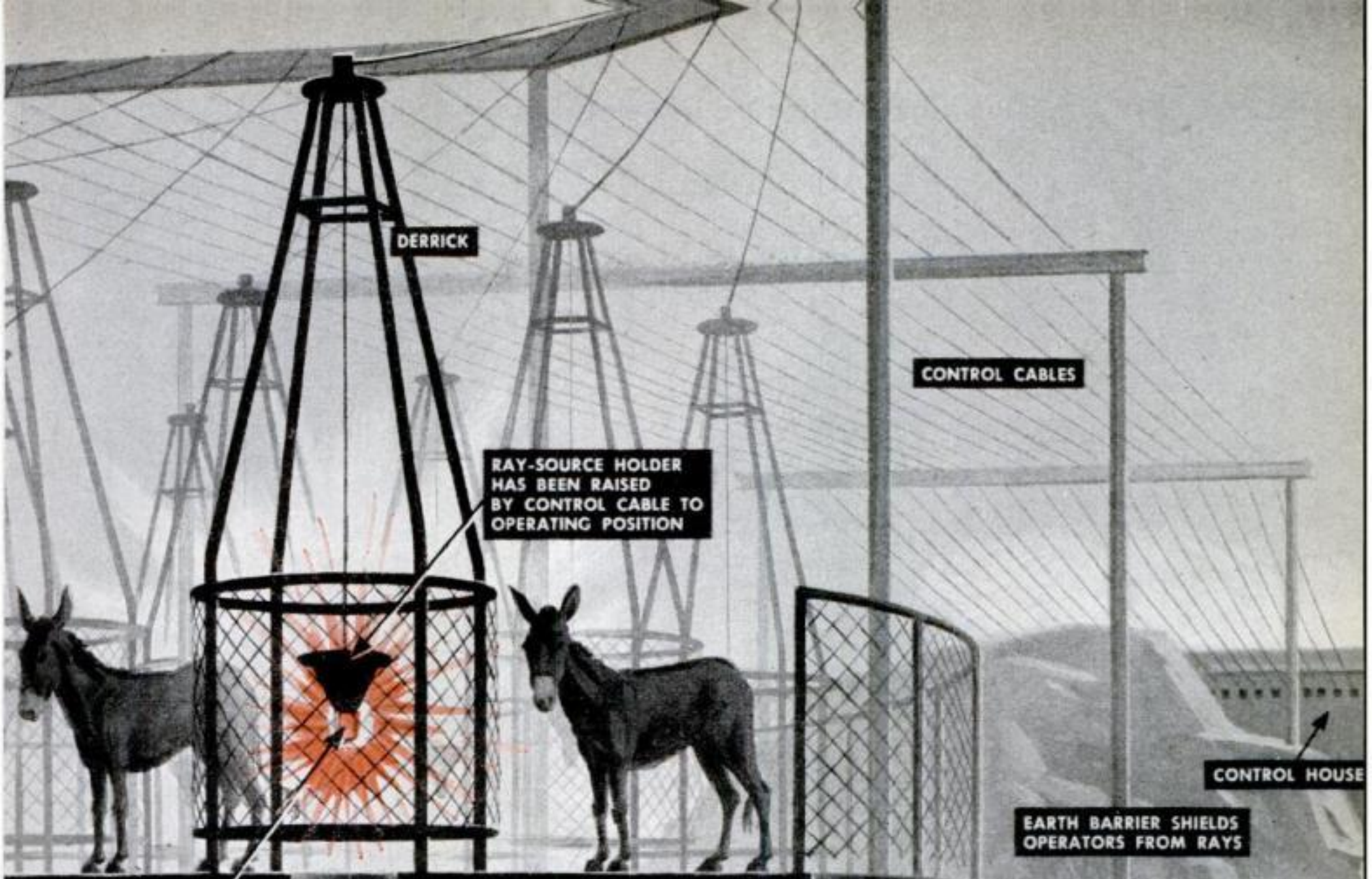
## Jet Engines Raise Sunken Ship

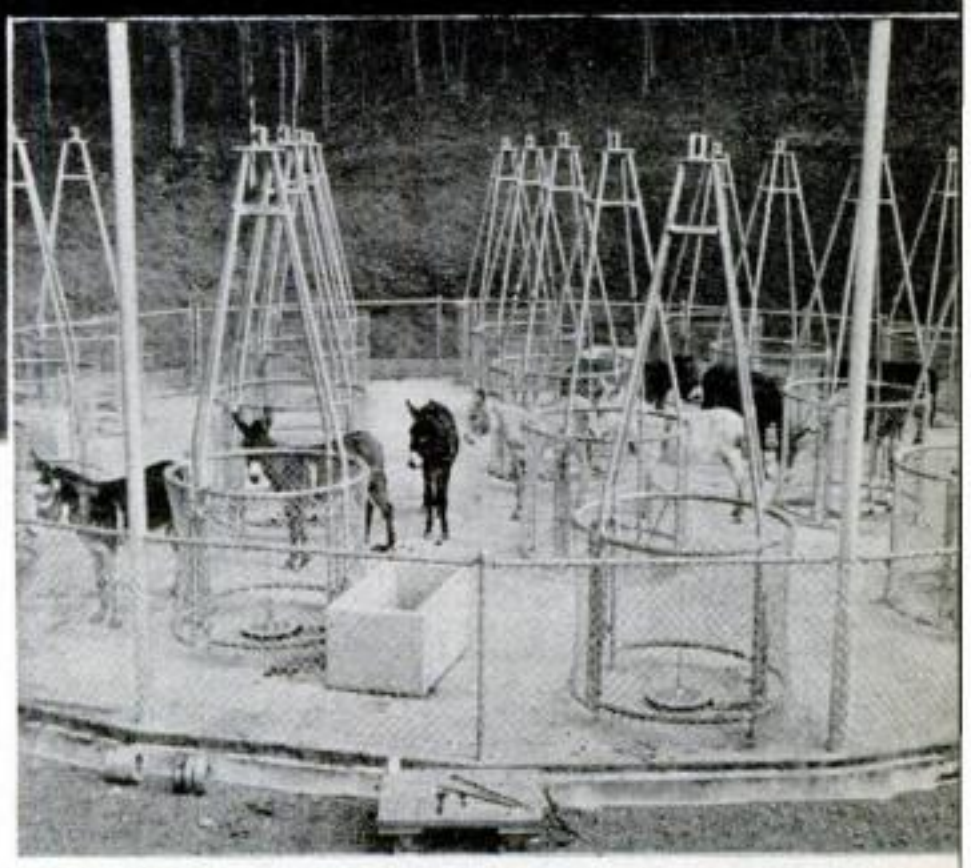
FLOATING on a cushion of compressed air created by jet engines, the wrecked HMS *Warspite* recently was raised and moved 40 feet nearer shore. The ship had been on the bottom off Cornwall for two years.

The exhaust gases from two Derwent jets were directed into sealed compartments of the ship, floating her in two hours. The salvagers say that it would have taken a battery of gasoline-driven air compressors two days, working day and night, to do the job.



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**HOW CORRAL WORKS** is shown in drawing. Burros test it in photo (from *Nucleonics*).

# Livestock Exposed to Hot Atoms

DONKEYS, horses and cattle roaming a "radioactive corral" at Oak Ridge, Tenn., may help scientists learn how atomic rays affect human beings.

Small animals, like mice and dogs, have usually served for such tests before. More could be learned from larger animals, but how to expose them to precise doses of radiation has been more of a problem.

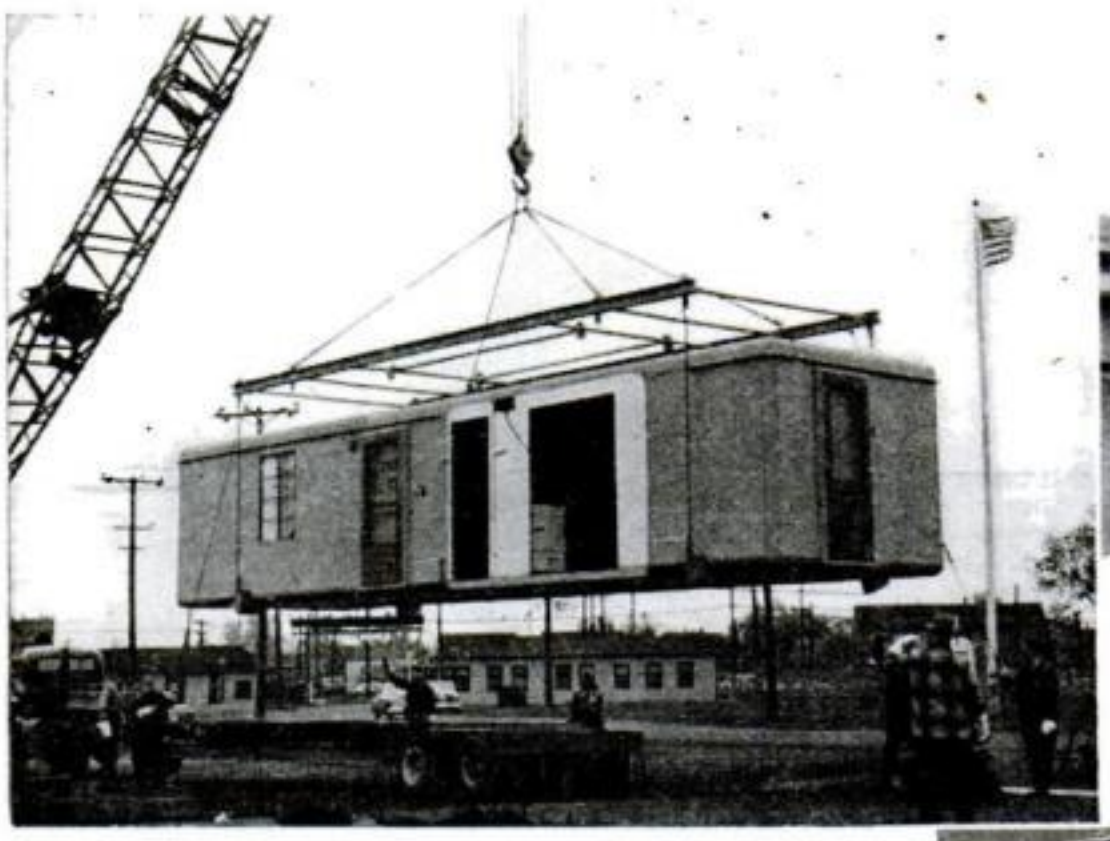
To solve it, the radioactive corral has a circular concrete floor 50 feet in diameter. Containers of radioactive tantalum 182 are kept safely shielded in 19 uniformly spaced water cisterns. After animals to be tested are led in, each ray source is hoisted into open air by a cable controlled from a nearby building shielded by an earth barrier.

In first trials, 10 Western burros at a time were placed in the corral with feed and water. Exposure meters worn by them showed they received reasonably uniform radiation, no matter where they wandered.



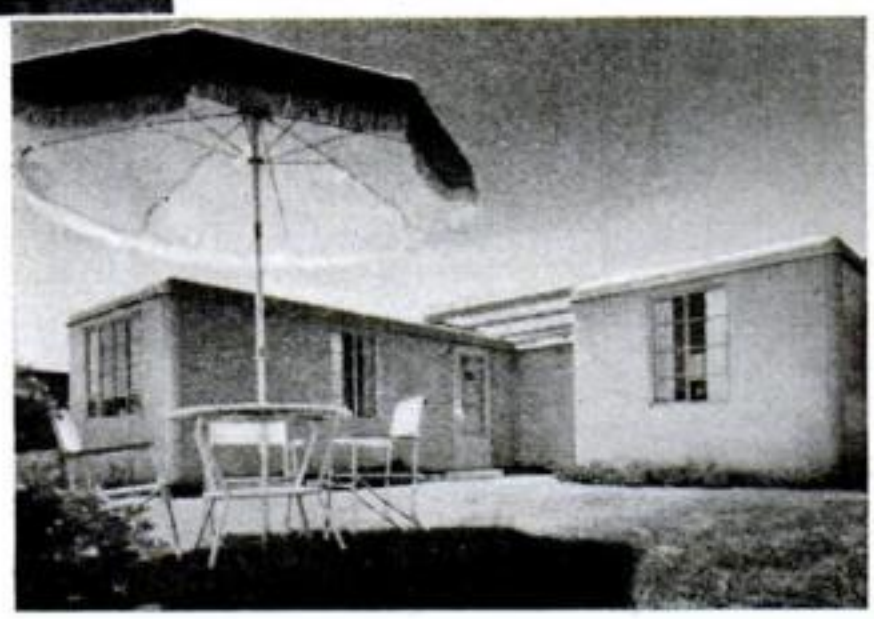
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## Portable House Can Be Shipped in Sections by Road or Rail





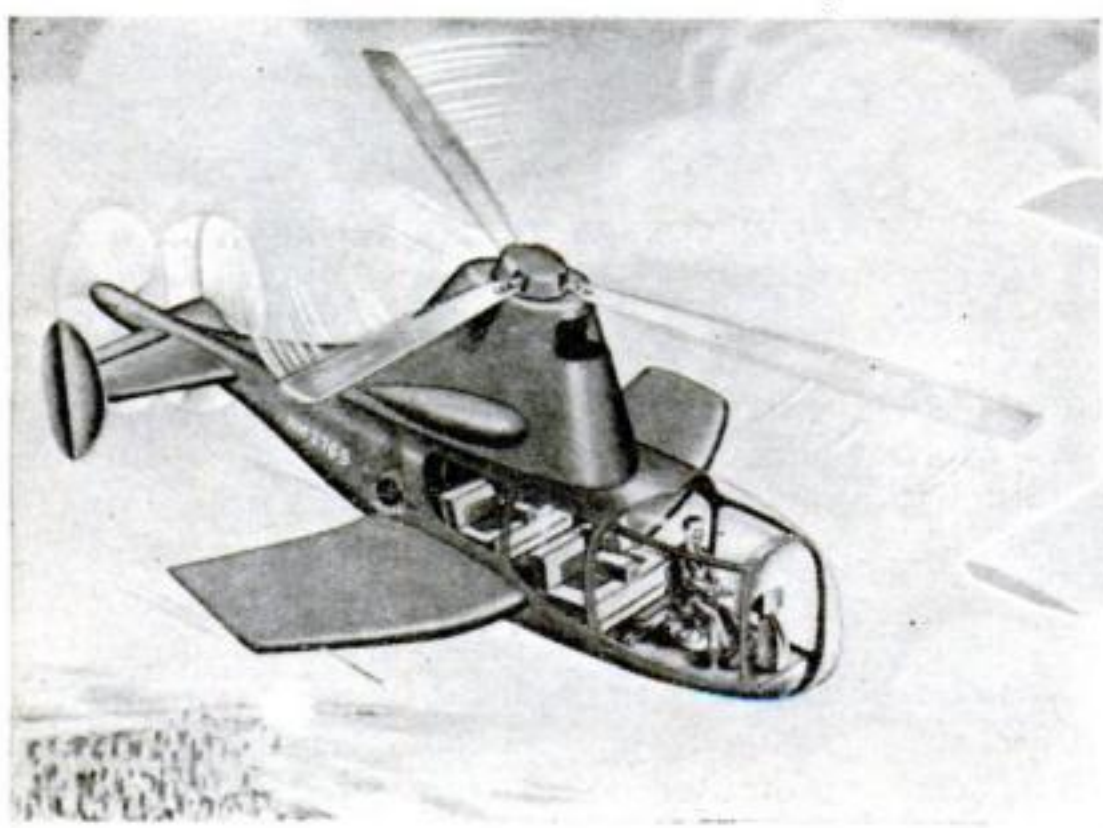
**WORKMAN** above tightens fittings between two of the units. The weatherproof, insulated walls are made of plywood laminations that are laid grain to grain and fused together.

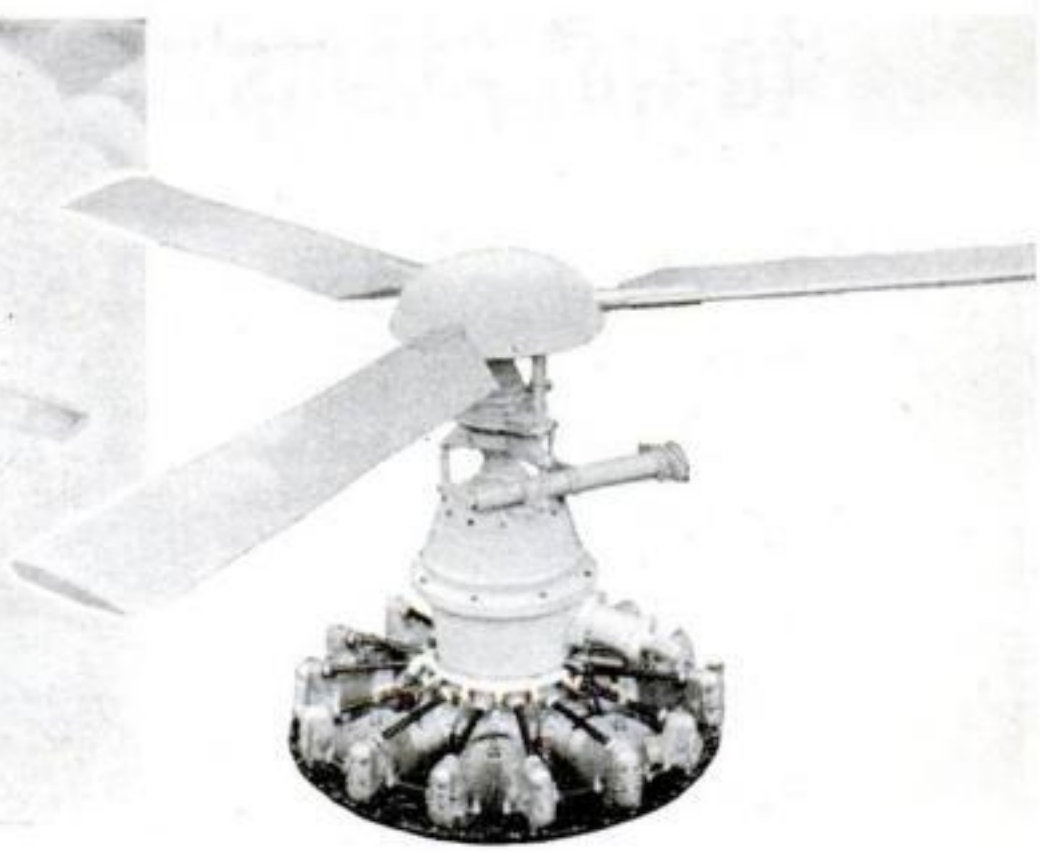


You can take this five-room house right along with you when you move. It was stripped of furnishings, dismantled in three units, carted a mile on a trailer to a new site and re-erected again in one hour and 38 minutes. H-shaped when set up (right), it has one section with living room and dining room (above), another with two bedrooms. Kitchen, utility room and bath connect the wings. The Pressed Steel Car Co., Hegewisch, Ill., makes the Unishelter.

## 'Copter Borrows from Plane Design, Gets More Muscle

WHILE the rotors on this helicopter spin like crazy, the stubby wings lend added lift. Through a drive from the main rotor gear, its 350-horsepower engine powers not only an anti-torque rotor in the tail but also a prop that gives an added push. Now in the blueprint stage, the craft is expected to reach a top speed of 190 m.p.h., a cruising speed of 155. Transmission, controls, rotor unit and engine are a single package (right below). Jacobs Aircraft Engine Co., Pottstown, Pa., claims that its power unit is 20 percent per horsepower lighter than comparable installations.





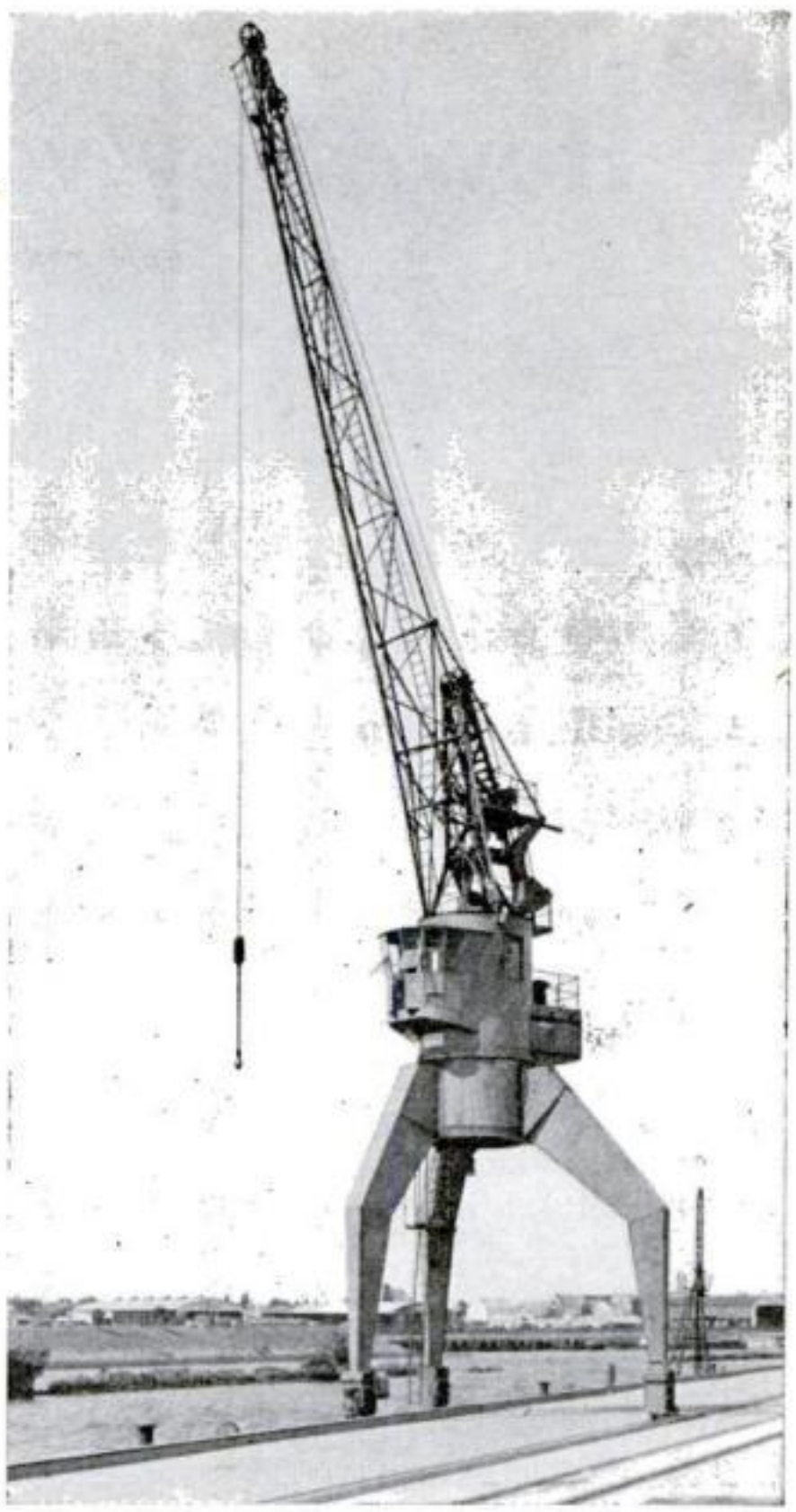


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## Talking Tank Fights with Words

THE 300-watt loudspeaker mounted atop the turret of this Army tank is a weapon. During Army maneuvers this spring it was used to broadcast surrender invitations to a theoretical enemy and to disseminate accurate news to counteract untrue enemy propaganda. The tank talker is part of the equipment of an Army Loudspeaker and Leaflet Company. It is made by University Loudspeakers, Inc., White Plains, N.Y.

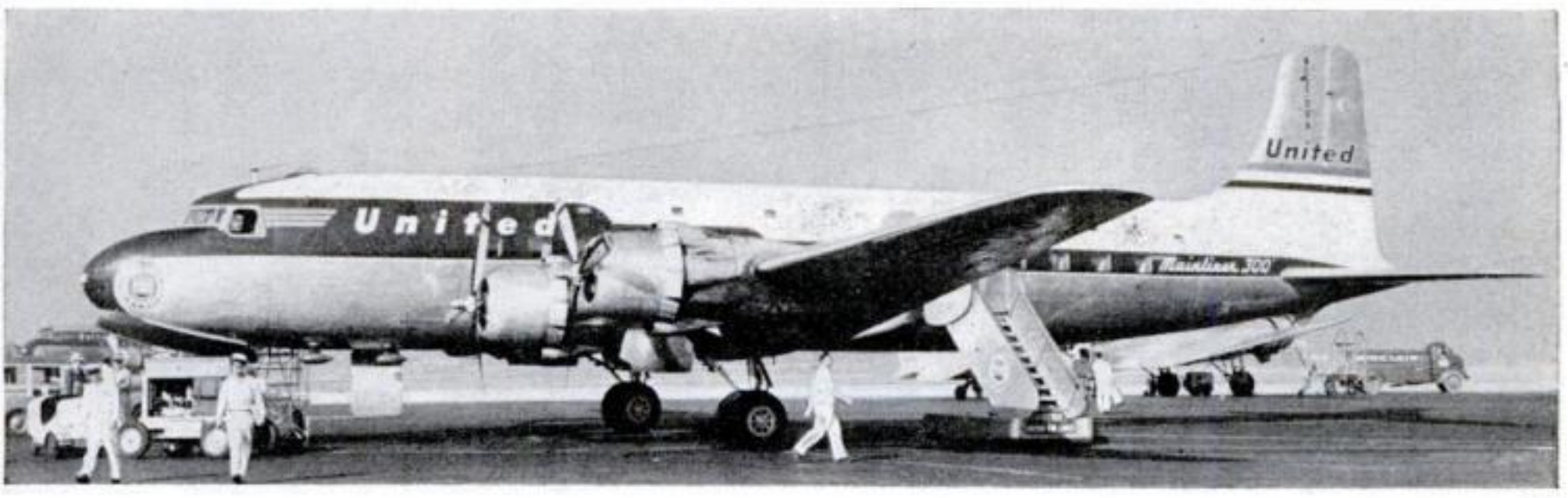


## 3-Legged Crane Saves Space

"GOLIATH'S tooth" is what dock workers call this unusual three-legged gantry crane, now at work in the harbor of Bremen, Germany. By using only one leg on the land side, the designers left room for trucks and workmen to move around when several of the cranes are side by side. The crane was built by the Demag Works of Duisburg.

## White Paint Keeps Cabin Cool

THE white top seen on the DC-6 Mainliner below reduces cabin temperature as much as 15 degrees. A Mexican outfit gave United Air Lines the idea. Four years ago they added "sunbonnet tops" to their fleet to reflect off the hot sun south of the border. Now the line has adopted the new color scheme for all its airliners.






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# How They've Made

# Hot Rods Safe

***Choppers in Pomona, Calif., have helped slash city's traffic toll. Yet they have more races than ever—thanks to a hot-rodding cop.***

**By Andrew R. Boone**

THE hot-rodders of Pomona, Calif., are largely responsible for a drop in Pomona's traffic death toll from 16 persons killed in 1949 to two in 1951.

If you're used to hearing of all kinds of accidents ascribed to hot shots, this news may lift your eyebrows. Yet the plain truth is that in Pomona (population 45,000), the boys in the souped-up jalopies have helped cut the auto death toll by seven-eighths.

And the Pomona hot-rodders have done all this without giving up either speed or the opportunity to win drags (the hot-rod word for races) and other contests—two big reasons for being a hot-rodder in the first place.

Three years ago, Pomona's traffic fatalities—like those of so many U. S. cities today—were leaping. So were hot-rod drivers, leaping all over the city streets, leaping out at pedestrians at dark corners at night. The hot-rodders were not, of course, responsible for the whole death toll. But they were involved in accidents, some fatal. They got a lot of blame.

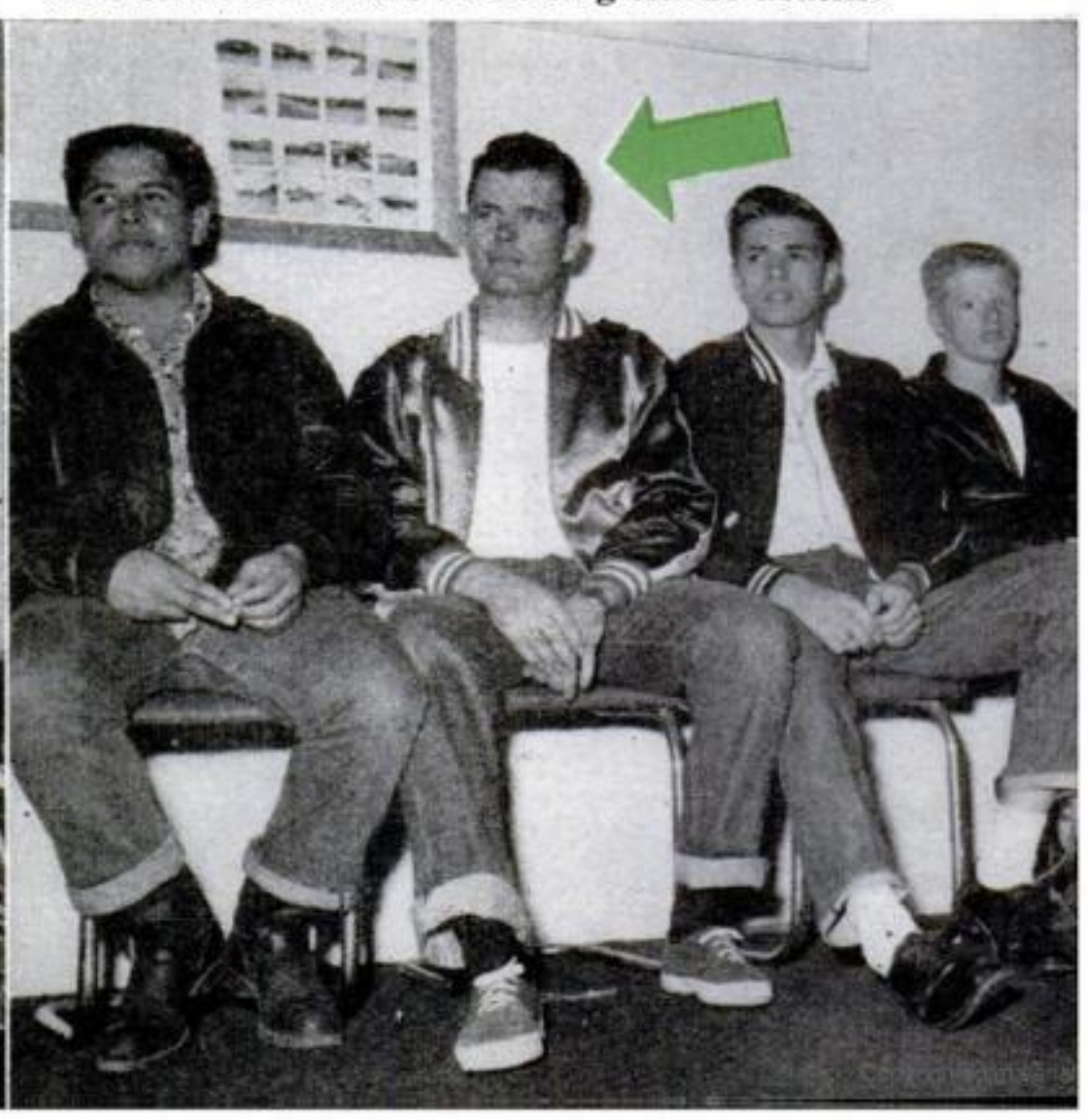
Motorcycle police repeatedly broke up the hot-rodders' drags along Pomona streets. More than once, judges helped the cops make wholesale arrests. California was alarmed and the state legislature passed laws against the hot shots.

Pomona's hot-rodders reacted. They greeted cops with boos and catcalls, moved sullenly, and, when a race was broken up by cops, would congregate on another dark

**CHOPPERS, 56 strong, meet weekly in basement clubhouse at Pomona police station. President Jerry Henderson conducts business session. The boys tolerate no lawbreakers.**

**POLICE SERGEANT BUD COONS (arrow) takes part in activities of Choppers, of which he is honorary member, wears their club jacket. He's led hot-rodders in cutting traffic deaths.**



**DRAG RACE STARTS** as two roadsters are waved off on black-top track at Los Angeles County Fair Grounds. Cars are timed as they dash between electric eyes at end of quarter-mile.

**INSPECTION** of '29 Ford roadster is carried out jointly by Sgt. Coons and California State Motor Officer Chuck Pollard. Unless car is safe on highway, it can't run on drag strip. California law requires headlights, license and rear-view mirror. This car passed. Choppers themselves inspect cars once a month, check brakes and steering gear before runs.

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# 'Poker on Wheels' Teaches Safe Driving



**COURSE FOR POKER RUN is marked for contestants by Calvin Turpin, who drops paper bags full of lime at intervals along road. Contest involves finding playing cards in sealed envelopes hidden along the course. Highest five-card poker hand at end wins. Players must not swap cards.**

street somewhere and set up another race.

Ralph Parker, the city's police chief, handed this headache to a young officer, E. J. (Bud) Coons, now 28 and a sergeant. Parker's instructions sounded strange indeed from a police chief:

"If you can't control 'em," he said to Coons, "join 'em. Then we'll see what happens."

Coons, in uniform, spoke to a meeting of a hot-rod club called the Choppers. His reception was cool. Coons wasn't controlling 'em.

Coons, out of uniform and in a T shirt and blue jeans, went to a later meeting and astonished the Choppers with a speech as unorthodox as had been his own instructions from Chief Parker.

### *He Made It*

"Listen," he said. "I'm a cop. But I'm a hot-rodder, too. We're not trying to throw the book at you guys. I want to join you. Together we can save lives, run fast on Sundays, have some fun in get-togethers."

To join the Choppers, you have to be

## Safety Tips from the Pomona Choppers

*MAKE sure body is well fastened to frame. Tighten all bolts. Make door latches secure.*

*If you alter or hand-make a new body, install plenty of inside bracing. That's for protection in case of roll-over. Chrome-moly tubing is best—it's tough and light.*

*Inspect steering knuckles for any slack. Kingpins are the main feature. Replace the mechanism if it's worn.*

*Use aircraft-type tubular shocks. They're available at parts stores in kits, complete with brackets.*

*Hydraulic brakes are a must. All newer cars have them, but they'll have to be installed on all models of earlier vintage than '35.*

*Use tires of a good grade, for your life depends upon your rubber. Get racing types for high-speed runs. No recaps, please.*

*Check the hubs, and make sure they're properly installed and secure.*

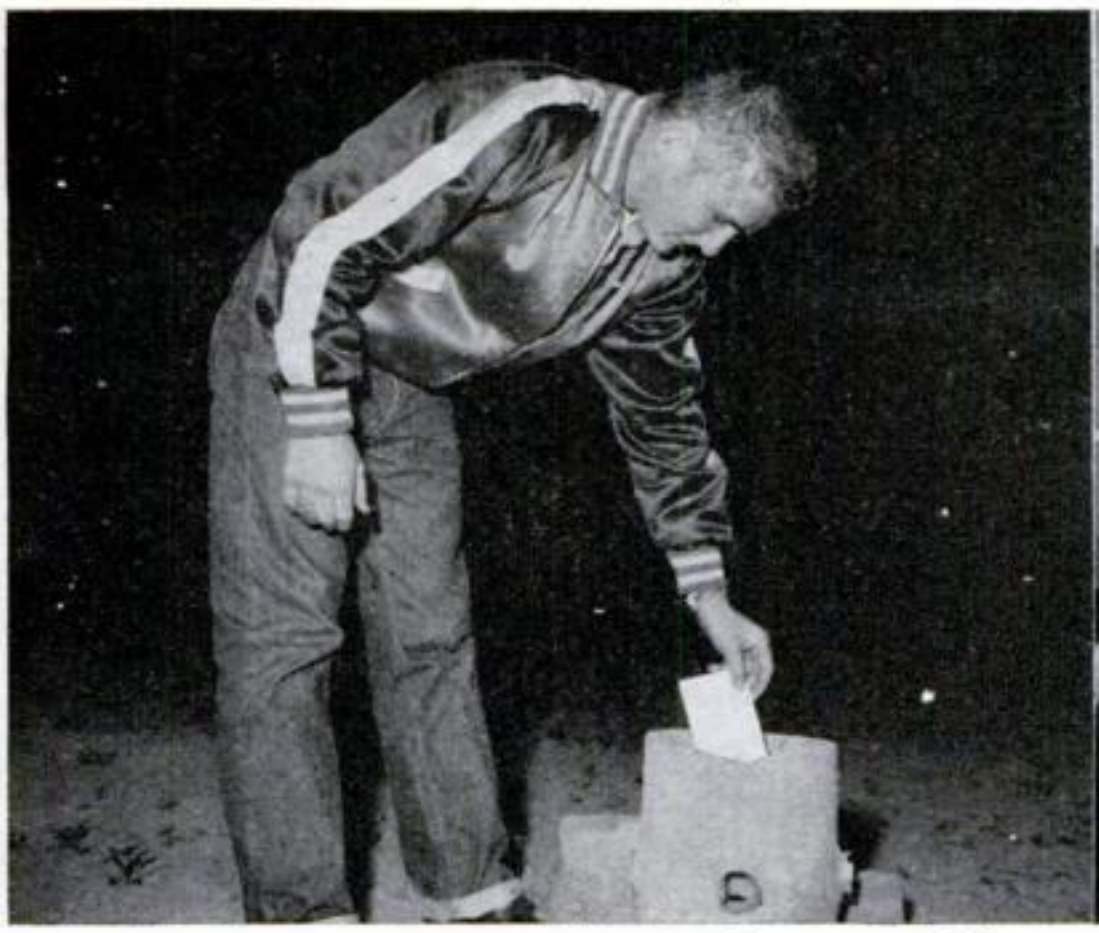
*Keylock all nuts where possible. Be certain no threads are even partly stripped.*

*Wear safety belt and crash helmet in all contests.*

*Stay under legal speed limits. Your car may be safe at 100 miles an hour, but only on a supervised and patrolled course.*



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**CONTESTANT TOM GORMAN** draws a card from a can hidden in a standpipe in a walnut orchard. Lime circle on highway warned him of card cache within 30 feet of road.



**SERGEANT COONS** is the final arbiter. He opens the sealed envelopes and announces the value of each poker hand. Winner gets jack pot made up of contributions from contestants.

voted in. Members drop marbles in a cigar box to vote. Three black marbles keep you out. Coons was elected an honorary member. He had joined 'em.

He offered to Choppers a program designed both to give them more than ever from hot rodding and to help cut Pomona's traffic toll. It took a while to get everything into effect. But the program included:

• ***Races each Sunday*** on the paved parking area of the Los Angeles County Fair Grounds. It cost the city $5,378 to add a quarter-mile black top for racing, with the hot-rodders to pay back the money from entry fees and admissions. Today, as many as 165 hot-rodders bring their cars each Sunday for time trials and races on the black-top strip. Thousands of spectators are attracted. They see plenty: a modified roadster recently did 127.32 miles an hour on the strip. The loan is being paid off on schedule.

• ***Insurance at the meets.*** "We carry $300,000 in public liability and $50,000 in property-damage insurance," Bud Coons explains. Nobody is in danger financially. Nor are life and limbs risked the way they were in the old days. Every car gets a thorough going-over once a month. Brakes and steering gear are checked before every run.

• ***Timed runs,*** a kind of economy drive in miniature. It takes driving skill to win one of these. Using public roads and highways,



**WINNER OF POKER RUN,** Johnny Vierya, drew three jacks and a wild joker to win the $6 pot with four of a kind. The run ends with a hot-dog feed.

hot-rodders take off at five-second intervals to compete for the best time within strict speed restrictions over a selected route. The route is marked on a road map given each driver. The speed restrictions: All cars must keep down to 17 m.p.h. in a 25-mile zone, to 23 in a 35-mile zone, and so on. Checkers record times. Too fast or too slow loses the race.

• ***An achievement plaque.*** The winner



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is determined by a point total. The boy who attends a timed run or other event gets one point. The winner gets extra points. The boy who manages a run gets five points. But any rabbit who gets a ticket for speeding or running a stop sign or another traffic violation is docked 10 points, and besides he has to stand up in a meeting of the Choppers and confess. The plaque holder keeps it for six months. There is a similar award for the best hot-rodder each month.

• ***Poker runs,*** or hunts for the best poker hand. The winner depends on pure luck. In this one, a driver follows splashes of lime on the pavement till he comes to a lime circle on the road. Then he knows there's a can of playing cards, each card in a sealed envelope, within 30 feet. The driver picks up an envelope, continues till he has made five stops. At the end of the run, all drivers gather, envelopes are opened, and the man with the best poker hand wins. No double parking at stops is permitted. Speed has nothing whatever to do with deciding the winner.



**POINT WINNER in club activities, Manuel Vallejo receives trophy for third six-month period in a row.**

Joining the Choppers worked for Bud Coons, as Chief Parker hoped it would. By the fall of 1952, summonses given to Choppers had dwindled to fewer than six a year.

One boy, who formerly was hauled in regularly by Coons for loud pipes, speeding or circling on screaming tires, had not had a ticket in two years.

The energies of the Choppers and other hot-shot groups were going into programs like Coons's. Such programs included more opportunities to win, more chances to display driving skill, more fun, and more chances for speed records on Sunday than hot-rodders had ever had before.

### *Speed with Safety*

And as the traffic death toll plummeted, the Pomona Lions Club gave the Choppers a trophy in appreciation of their work.

"Don't get them wrong," Bud Coons says today. "They're still hot-rodders. I'm just as much of a hot shot as these guys. We've just learned to control ourselves on the streets and take our speed on the strips where the public won't get hurt."

Probably one reason Coons is so effective in teaching safety is that he has a personal interest. He has a jagged scar on his forehead. "Got that," he tells you, "on a cycle."

As the Choppers' program thrived, the club grew so large it could no longer meet in members' homes. How radically things in Pomona had changed was shown then. The Choppers, who in 1949 booed a cop on sight, selected as their permanent meeting place the basement of the Pomona police station. END

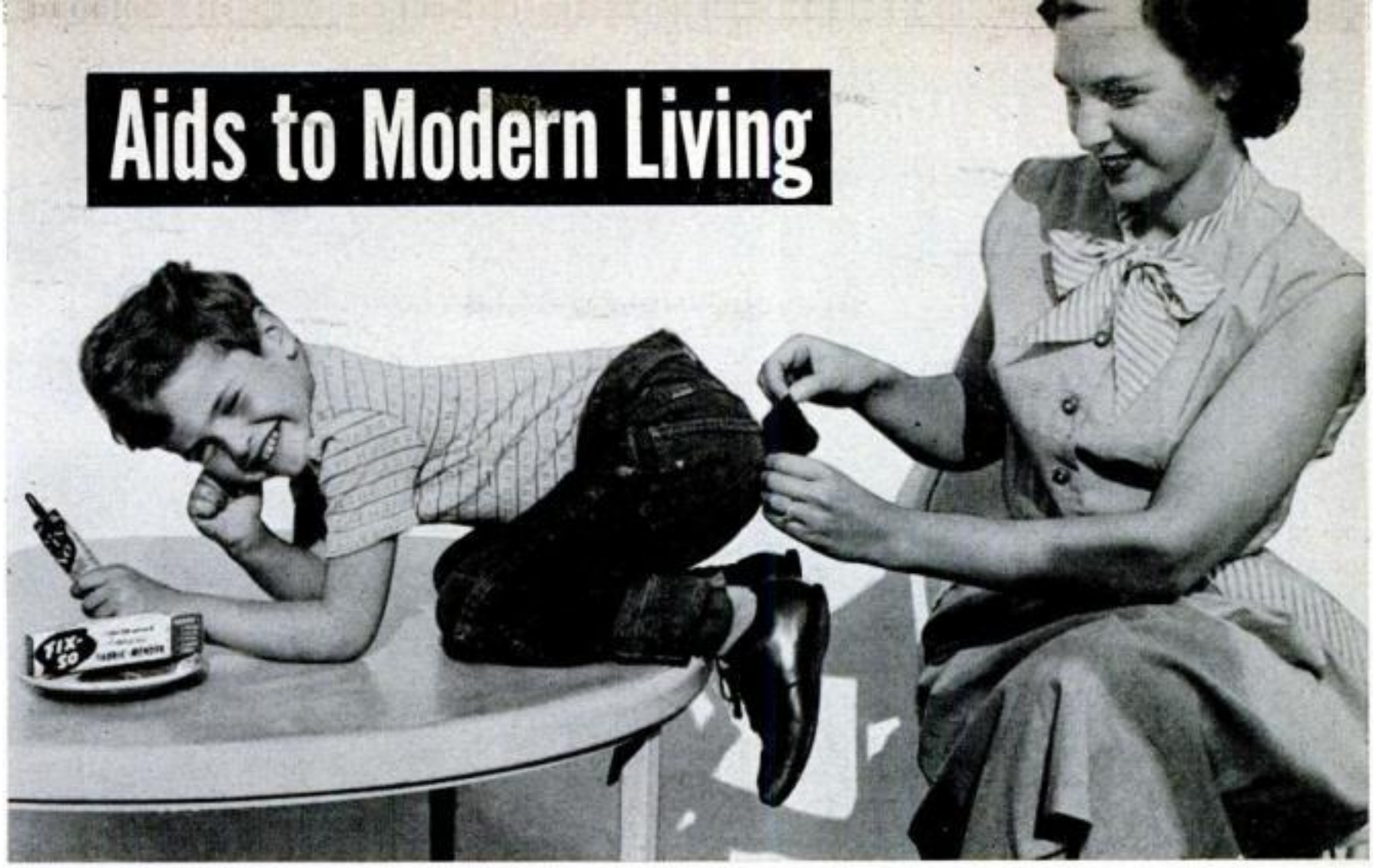
***Next Month: PSM will give you the low-down on special tires for winter driving.***

## Rough Treatment Roughens Slick Roads, Prevents Skidding

THE highway department itself is burning up the roads in California. Its engineers found that heating and scratching black-top pavement roughened the slick surface enough to reduce skidding considerably. The rig (below) consists of a weed burner, which softens the road, followed by a rake-type drag, to cut skid-preventing grooves.



# Aids to Modern Living




**1. Mending Fluid.** A stitch in time may save nine but a dab of this stickum on the back of a patch saves all the stitching. Patches are just patted into place and the mending basket is emptied fast. Fix-so will darn socks, patch jeans, mend sheets, turn up hems and put in zippers. Washing, ironing, even boiling won't dislodge patches.



**2. Sewing Chair.** One arm of this chair slides out, disclosing a tray to keep sewing tools handy. Compartments are provided for spools of thread, needles and scissors.



**3. Clothes Drier.** A room never gets steamy when this Frigidaire drier is in operation. It has a filter that condenses moist air and traps lint. Moisture drains into tray.

*Further information on these products can be obtained from: 1. Cossman & Co., 6612 Sunset Blvd., Hollywood 28; 2. Greaves & Thomas, c/o Matthew Crosse News and Features Service, 18A St. James Place, London SW1, England; 3. Frigidaire Division, General Motors Corp., Dayton 1.*

**Please turn the page for more aids to modern living.**

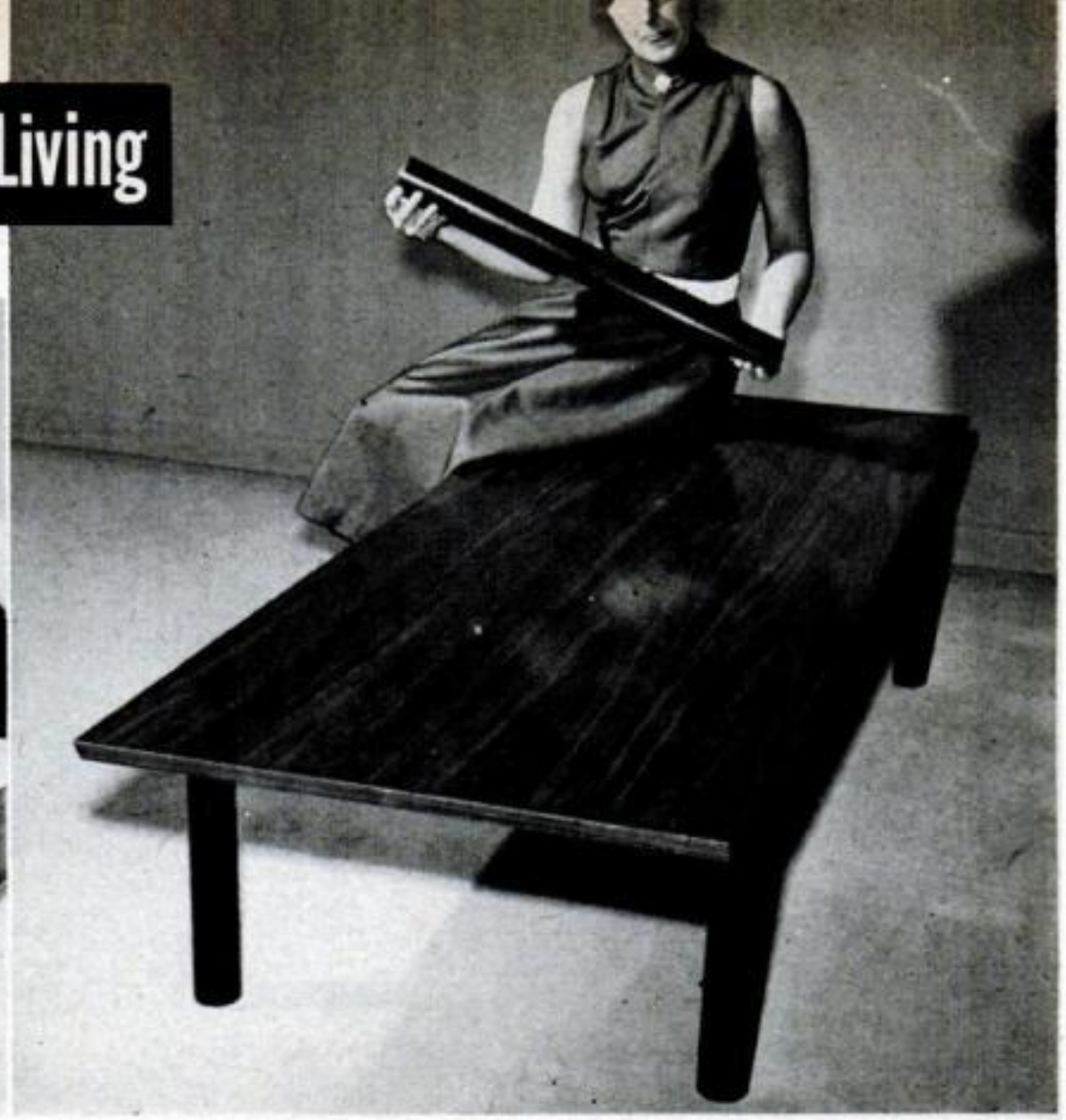


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# *MORE* Aids to Modern Living



**4. Branding Iron.** Burn your initials on shop and garden tools—just like a rancher brands cattle—and they'll be easier to round up. This iron heats over any open flame, works on plastics and leather as well as on wood.



**5. Dual-Use Table.** Two sets of threaded legs come with this table, doubling its usefulness. Replacing the short legs of the 17-inch-high coffee table with longer legs forms a dining table that is 28 inches from the floor. Edward Wormley of New York is the designer.



**8. Ear Pad.** This doughnut of foam rubber will ease ear pressure for workers who use the telephone a lot, and it will block out noise at the same time. Adhesive on one side holds it firmly on the earpiece. The pad can be removed for washing.



**9. Casserole.** Campers have been cooking with canned heat for years. Now fancied-up casserole dishes simmer and bubble over the same fuel on the dining table. With this one, any camper can whip up a supper in jig time when the cook is away.



**10. Glass-Block Vent.** Half a glass block framed in aluminum makes this ventilator. A handle indoors opens and closes the Panel-Vent. When closed, the block fits against a weathertight gasket. When open, an inside screen keeps insects out.



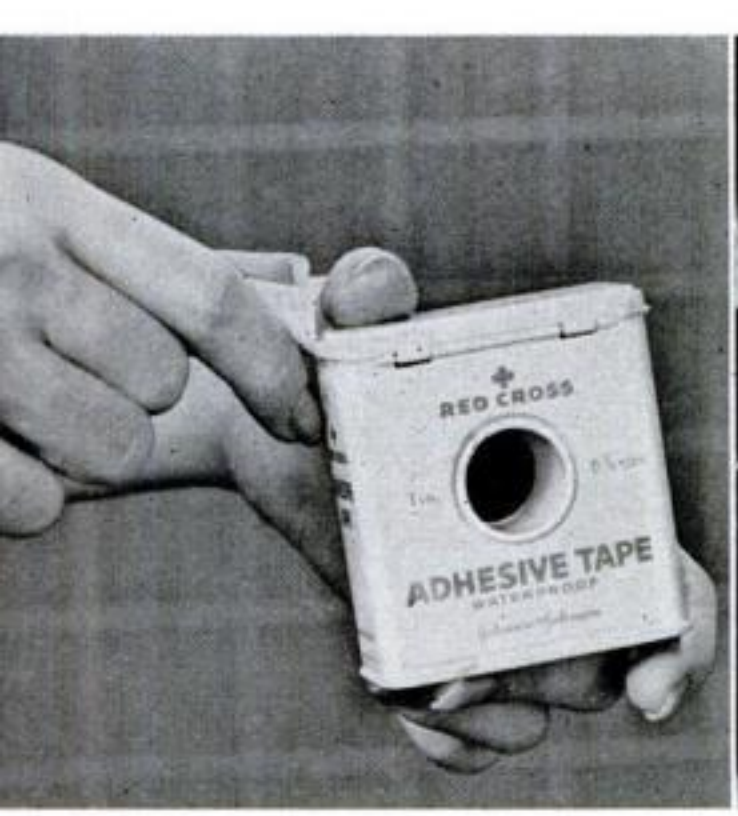
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**6. Baby Bath.** This inflatable plastic tub leads many lives. It's a crib when visiting, a car bed when motoring and serves as a wading pool or beach float as the child grows. Deflated, it fits in a drawer between baths, packs in a suitcase for travel.



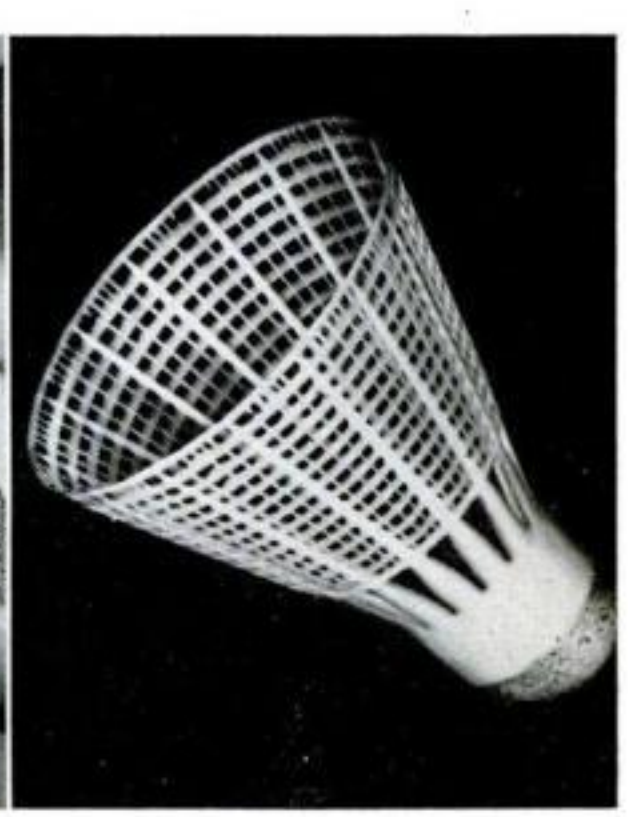
**7. Glass Door.** This patterned door lets in light but assures privacy. The ⅜-inch-thick glass slab is heat-treated to make it stronger than ordinary glass of the same thickness. Its ball-bearing hinges, lock and knobs are bronze-finished.




**11. Cut-Quick Tape.** You don't need scissors to snip a bit of adhesive tape from this roll. The lid of the box has a serrated edge to do the cutting for you.



**12. Removable Zipper.** If this zipper sticks, push back on the pull tab to open its jaws and lift it off the track. Reclamped on the track, the lock slides freely again.

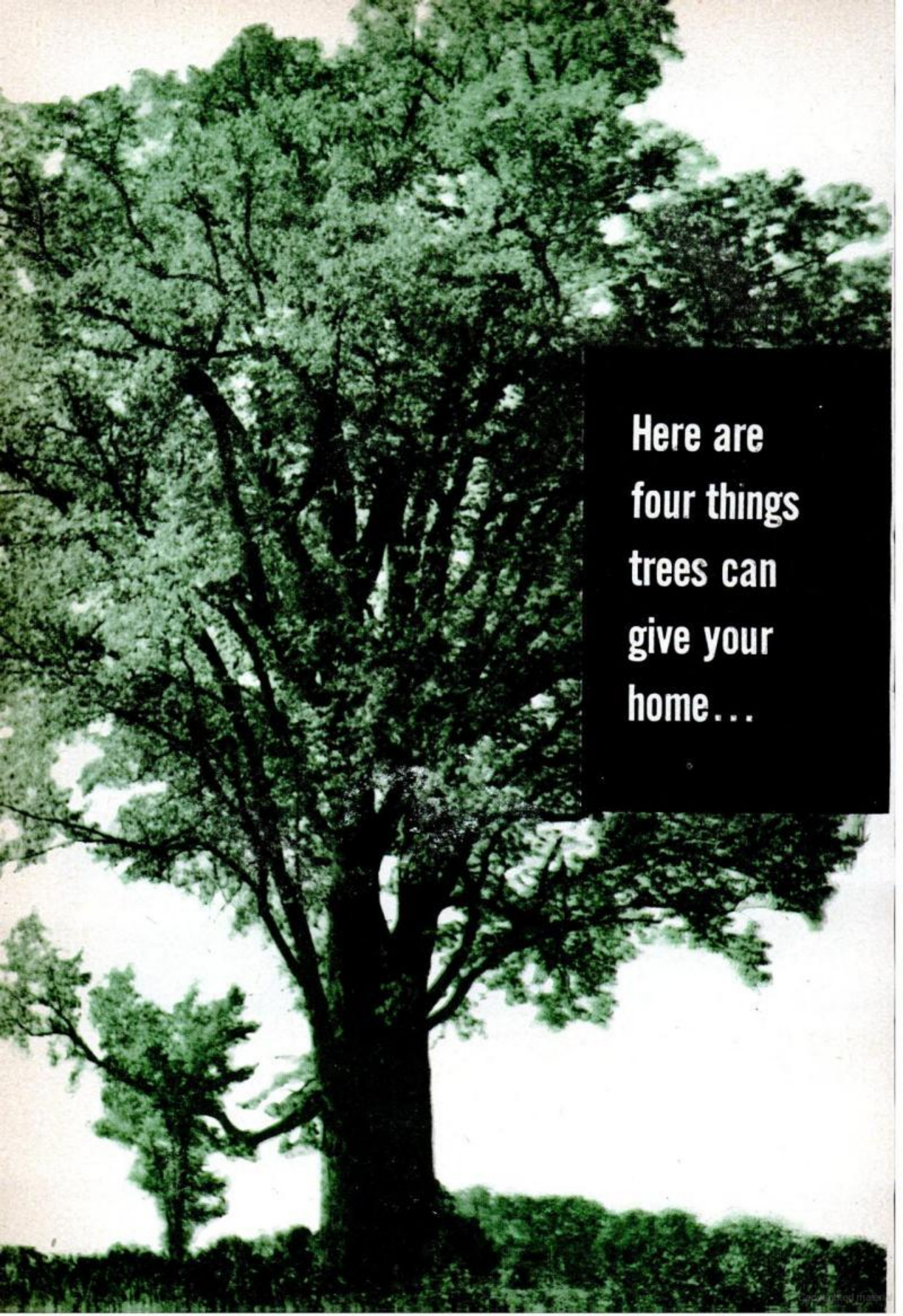


**13. Plastic Bird.** This latticework shuttle is light enough for official badminton but husky enough, the maker says, to outlast four of the feathered kind.

*Further information on these products can be obtained from: 4. Hammacher Schlemmer & Co., NYC; 5. Dunbar Furniture Co., Berne, Ind.; 6. Guarantee Products Co., South Bend, Ind.; 7. Libbey-Owens-Ford Glass Co., Toledo 3; 8. Gerrard Industries, 63 Gerrard St., West, Toronto, Ont.; 9. The Krebs, Westerly, R.I.; 10. Kimble Glass Co., Toledo 1; 11. Johnson & Johnson, New Brunswick, N.J.; 12. Snag-Pruf Zipper Corp., 2 Park Ave., NYC; 13. Alex Taylor & Co., 22 East 42nd St., NYC.*

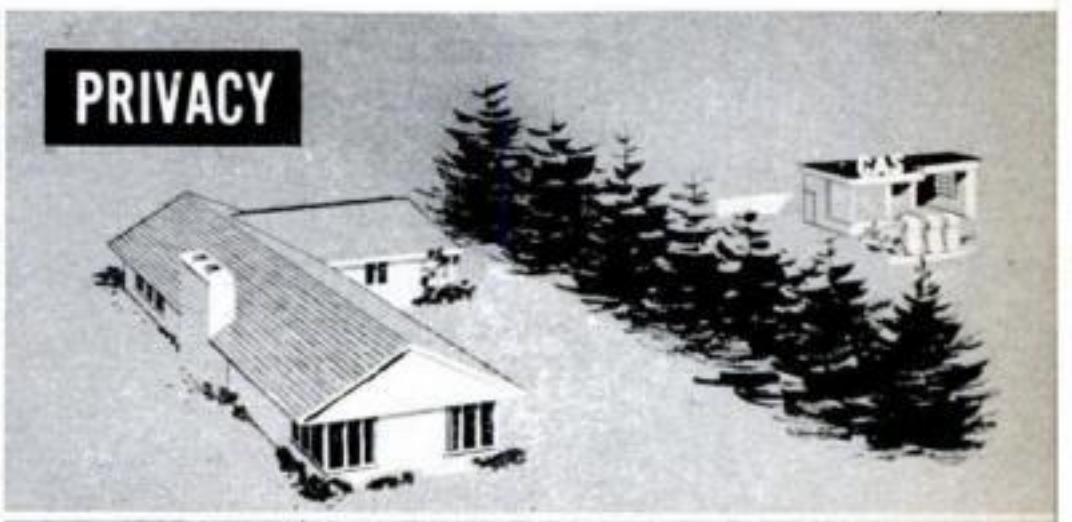


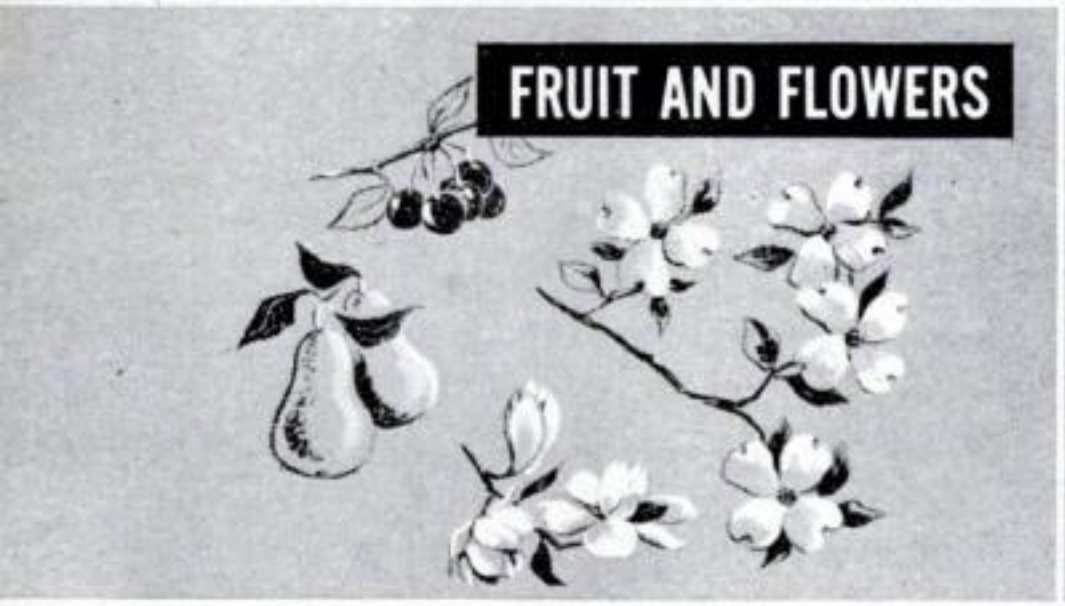
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Here are
four things
trees can
give your
home...

# How Trees Can Make a House More Valuable







***Plan your planting now—while it's easy to foresee the results. Then, when leaves are down, you can put in the trees you need.***

**By Hartley E. Howe**

THIS is the life, you think. No more landlords, no more rent, no more noisy neighbors upstairs—you're an independent homeowner now.

And then the little woman comes in. Did you notice, she says, how bare the house is as you come up the street—like a gasoline station? And do you realize, she says, that everyone driving by can look right in the picture window and see you with your feet on the coffee table?

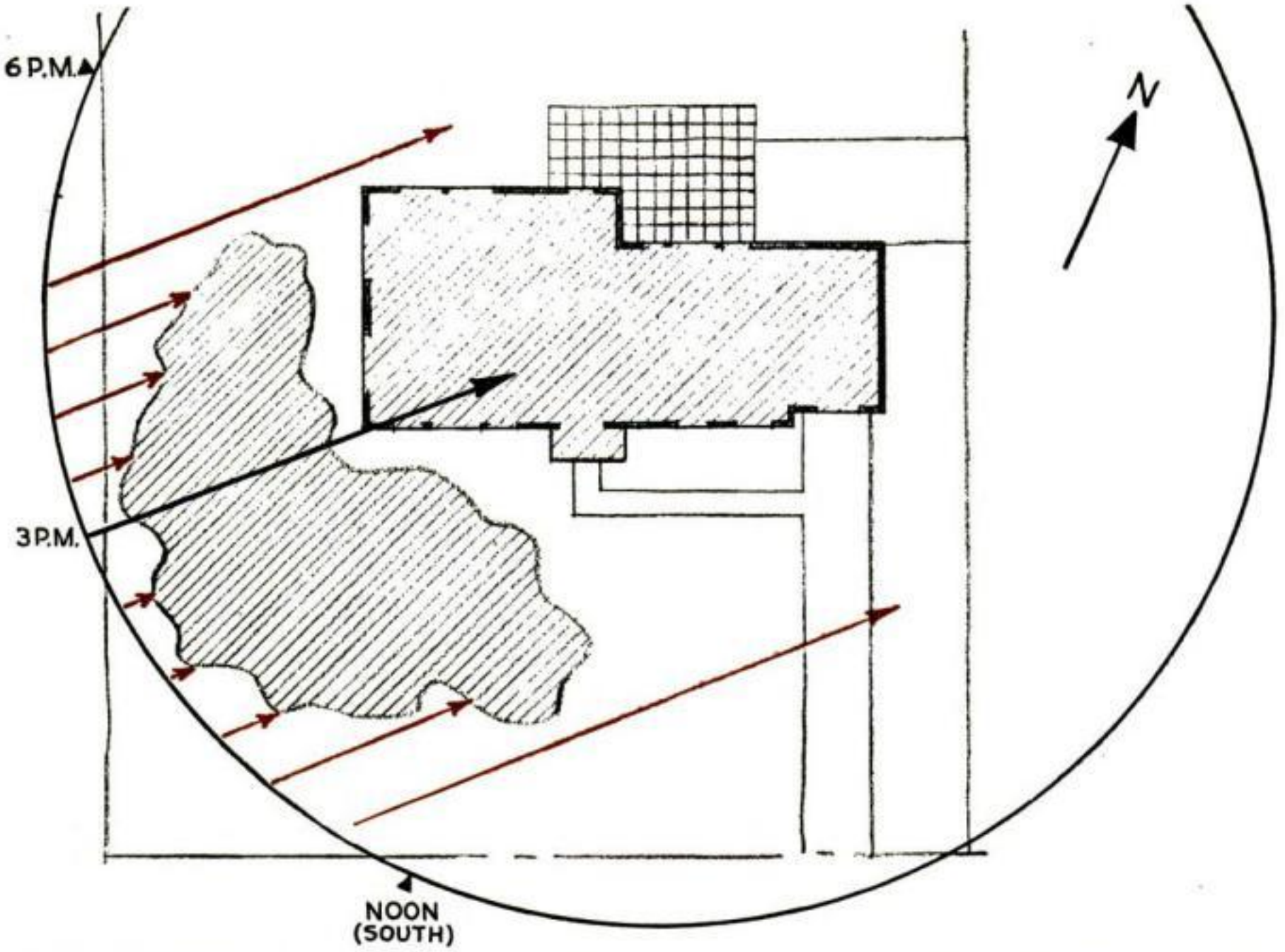
And then, brother, you realize you've still got problems. Four walls and a roof are only the start of your home.

Fortunately there's a remarkable machine that will solve a lot of your problems. It's an automatic awning that cuts out hot sunshine in August but lets it in in December. It's an efficient cooling machine. It's a wall that builds itself and never needs painting or repairing. It's a playground for the kids, a flower shop and a fruit-and-nut stand. And it's mighty handsome around the yard. It's called a tree.

Most house builders just bulldoze them out of the way. But this country needs more



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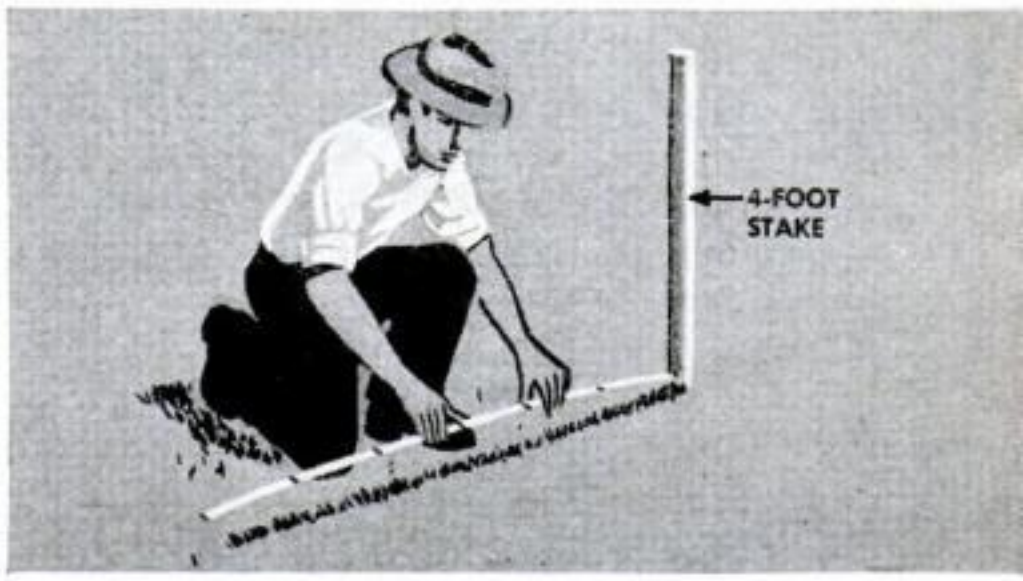

**TO FIND DIRECTION** of sunlight and shadows in hot hours, draw an arc around southern half of your sketch plan. Mark due south: sun will be there at noon, standard time, will move about 15 degrees along arc each hour. Point for any desired hour can be found with protractor. Lines parallel to arc radius at any point will show direction of sun's rays at that hour (it's three o'clock above). Block in places trees must go to shade house then.

trees. And now's the time to plan them. When tree-planting time comes, in the fall, all but the evergreens will have lost their leaves and it will be hard to tell what they look like. So look at your neighbors' trees and visit nurseries now, when trees are in full leaf. Make your plans in late summer and be ready in the fall.

For there's a lot more to planting trees than getting a mess of saplings and sticking them in at random. Trees come in all shapes and sizes. A good yard takes as much planning as a good shop.

- Make a rough plan of your house and yard so you get the trees in the right place the first time. Transplanting is hard on both you and the tree. You may have gotten a survey map with your deed, which you can trace. Locate true north (which may be different from the compass reading).
- Figure out just what you want trees to do for you. Trees vary as much as tools—and you wouldn't buy a milling machine to build a garden chair.
- Now decide where the trees must go to meet your needs. Block them in on your plan. All you need is a rough indication of their size when grown.
- Finally, choose the kinds of trees that have the proper shape and size.

Let's run down what trees can give you.




**LENGTH OF SHADOWS** can be found by this method. Some sunny summer day, stick four-foot stake in lawn and measure shadow. Tree shadows will be in same ratio to stake shadow as tree heights are to four feet.



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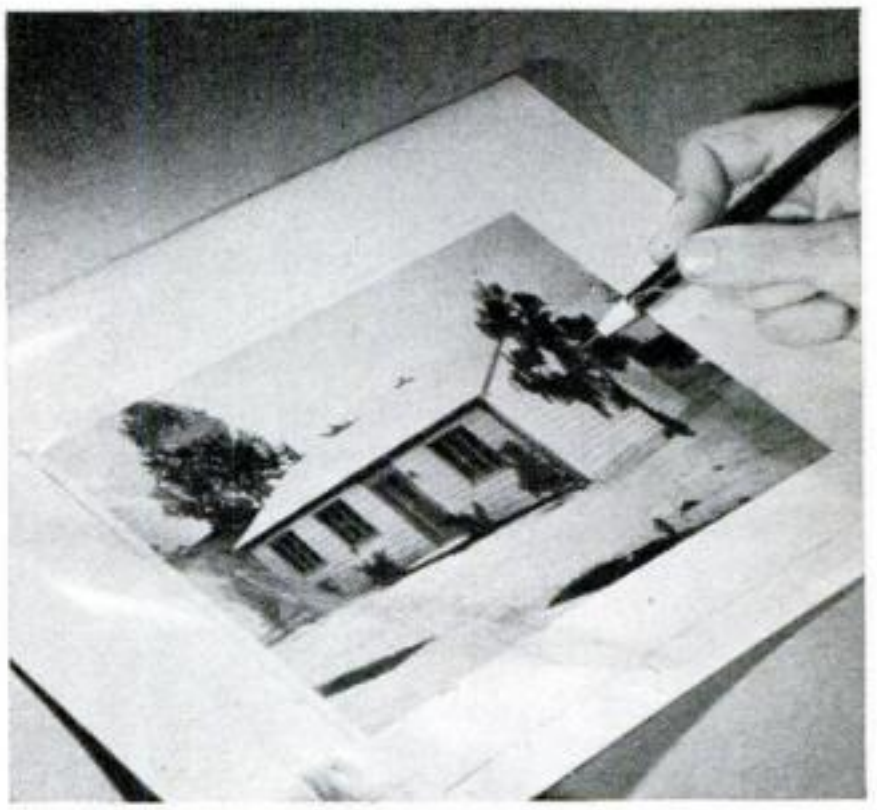
***Shade and coolness.*** An unshaded picture window can seem like an open furnace door on a hot day. Properly placed, trees can cut the summer temperatures in your house from five to 15 degrees—mighty cheap air conditioning. And they'll shed their leaves to let the winter sunlight in when you want it.

What you have to find out is where the summer sunlight comes from—what direction and from how high in the sky. This can be calculated for any place, day and hour by a trigonometric formula using latitude and longitude. But you can get close enough with a little experimenting and rule-of-thumb methods as shown in the accompanying diagram. Incidentally, if you live near the edge of your time zone, the sun will arrive at due south almost half an hour early or late by the clock.

Remember that the sun will be highest late in June so you will need taller shade trees than experiments made this month will show. Don't bother to find the direction of sunlight for every hour of the day; concentrate on the hot hours—from noon to four o'clock usually.

You may find that to get enough shadow you'll need a big tree. Grown trees are expensive, so it's better to start with a smaller, fast-growing tree. Put it closer to the house so that it gives the same shade. A fast-growing five-year-old tree usually takes about five more years to attain 80 percent of its shade foliage. You can put in a sapling of a future big tree farther from the house to take over later.

When you plot a shade tree on your plan, it's a good idea to show not only its present bulk, but how wide it will grow later on.

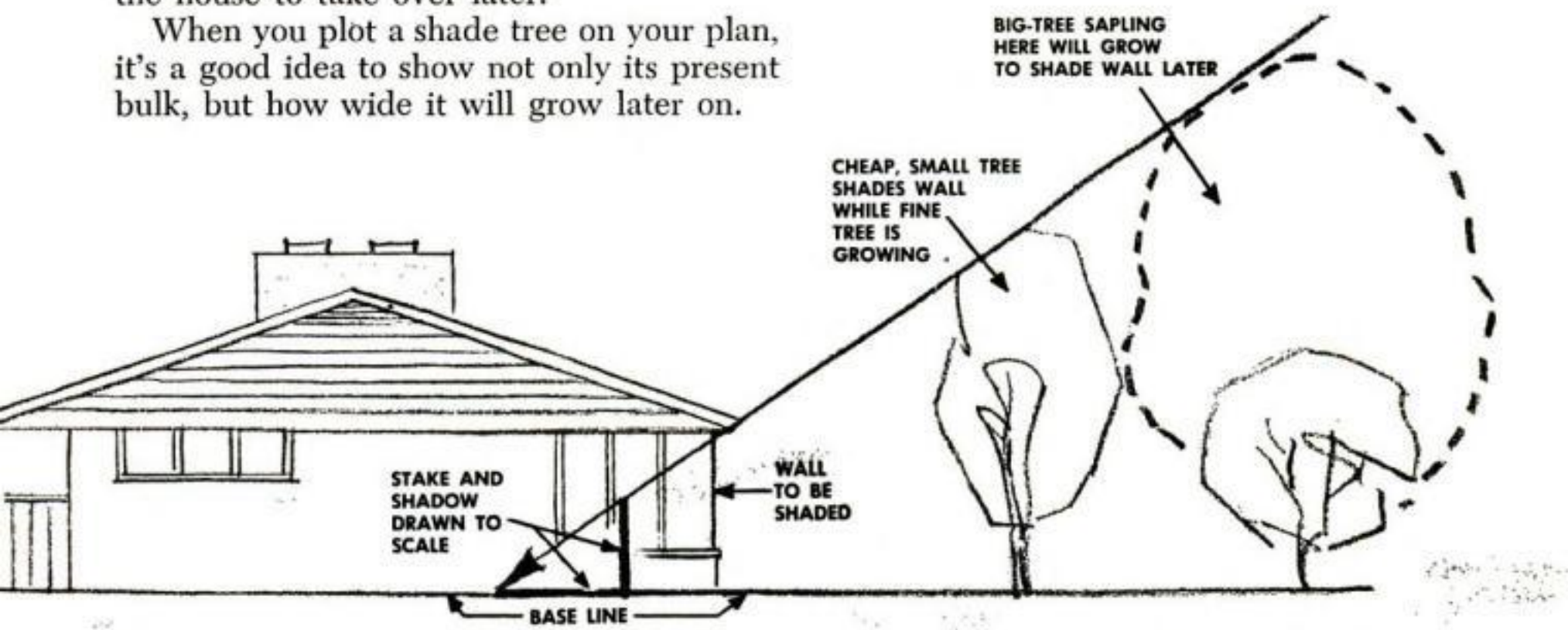


**HOW TREES WILL LOOK can be visualized by covering enlarged photograph of house with acetate or tracing paper and blocking in with a grease pencil where leaf masses will come.**

Trees actually cool, besides giving shade. Unlike an awning, they use some of the sun's energy for growth, instead of reflecting it or absorbing it for reradiation later. According to German tests, it is also slightly cooler below the treetops of a forest than above, even ignoring the direct heat from sunlight. Turbulent air currents keep some hot air above the crown, while cooler air sinks down between the trunks.

***Windbreak.*** Trees can block wind and snow as well as sun. The big "shelter belts" on the plains of the Midwest use several

[Continued on page 236]




**HEIGHT OF TREES you need to shade house at any given hour can be found on scale drawing showing stake and shadow at that hour. Line from shadow's end past top of stake will be shadow angle. Any tree whose top reaches shadow line will shade house wall at that point (at other points shadow falls lower on wall). Measuring along base line will show how far tree must be from house. To shade entire wall, you'd need row of trees.**



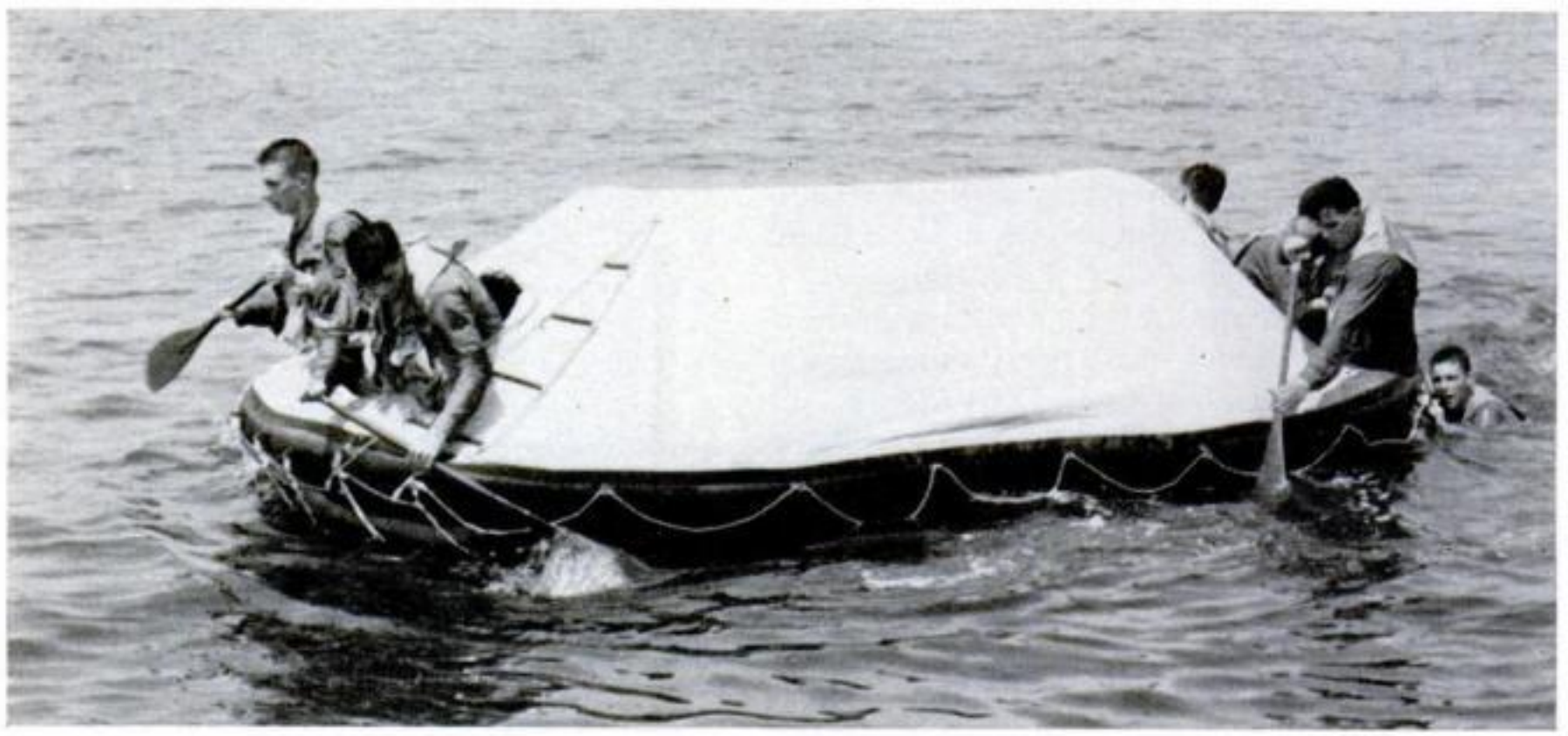
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**1** **"SURVIVORS"** swim toward the raft package in recent demonstration. A pull on a cable releases carbon dioxide gas that snaps the 230-pound craft out of its case and inflates it.



**2** **INSULATING CANOPY** is automatically raised as gas fills rubber arches that will support it. The three-inch-thick floor liner is inflated by hand, can serve as extra raft.



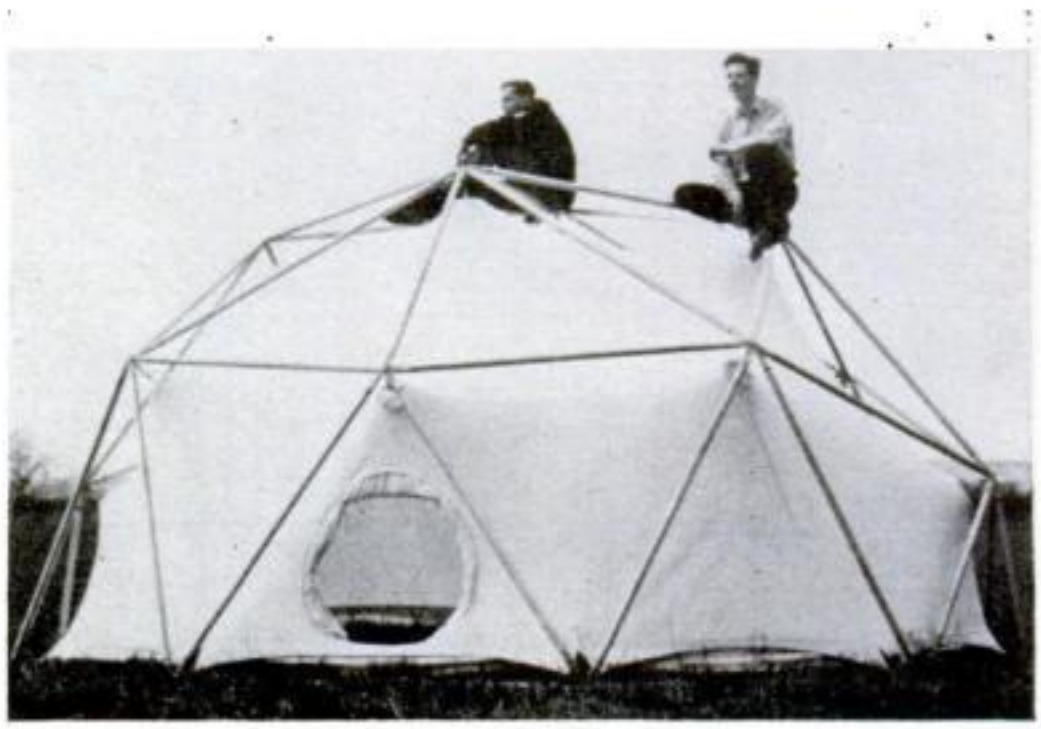
**3** **FULLY INFLATED IN 30 SECONDS,** raft has two entrances that can be left open or closed, depending on weather. Navy's Bureau of Ships and B. F. Goodrich Co. developed it.

## New Raft Protects Survivors Against Arctic Cold and Tropic Heat

SHIPWRECKED sailors can set up comfortable emergency housekeeping on seas from the Arctic to the Equator aboard this new life raft. Its thick canopy and floor liner contain insulating spaces that shield the raft against heat or cold. With 15 men aboard, body heat alone can maintain the interior at 70° even in sub-zero weather.

## Inside-Out Tent to Beat Arctic Blizzards

BUILT to call the bluff of the most boisterous blizzard, this new arctic tent is built inside out. The complete packaged unit weighs only 145 pounds, can be erected by two men in 25 minutes. The aluminum-tubing frame can take an extra cover in extreme weather. It will be used on Baffin Island next summer by scientists of the Arctic Institute of North America.





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### *Wilbur Shaw Tells Why*

# A Lot of Guys Love the MG




***It's hard, cramped, low-powered—everything Americans are supposed to hate—yet its sales are booming.***

REPORT FROM THE



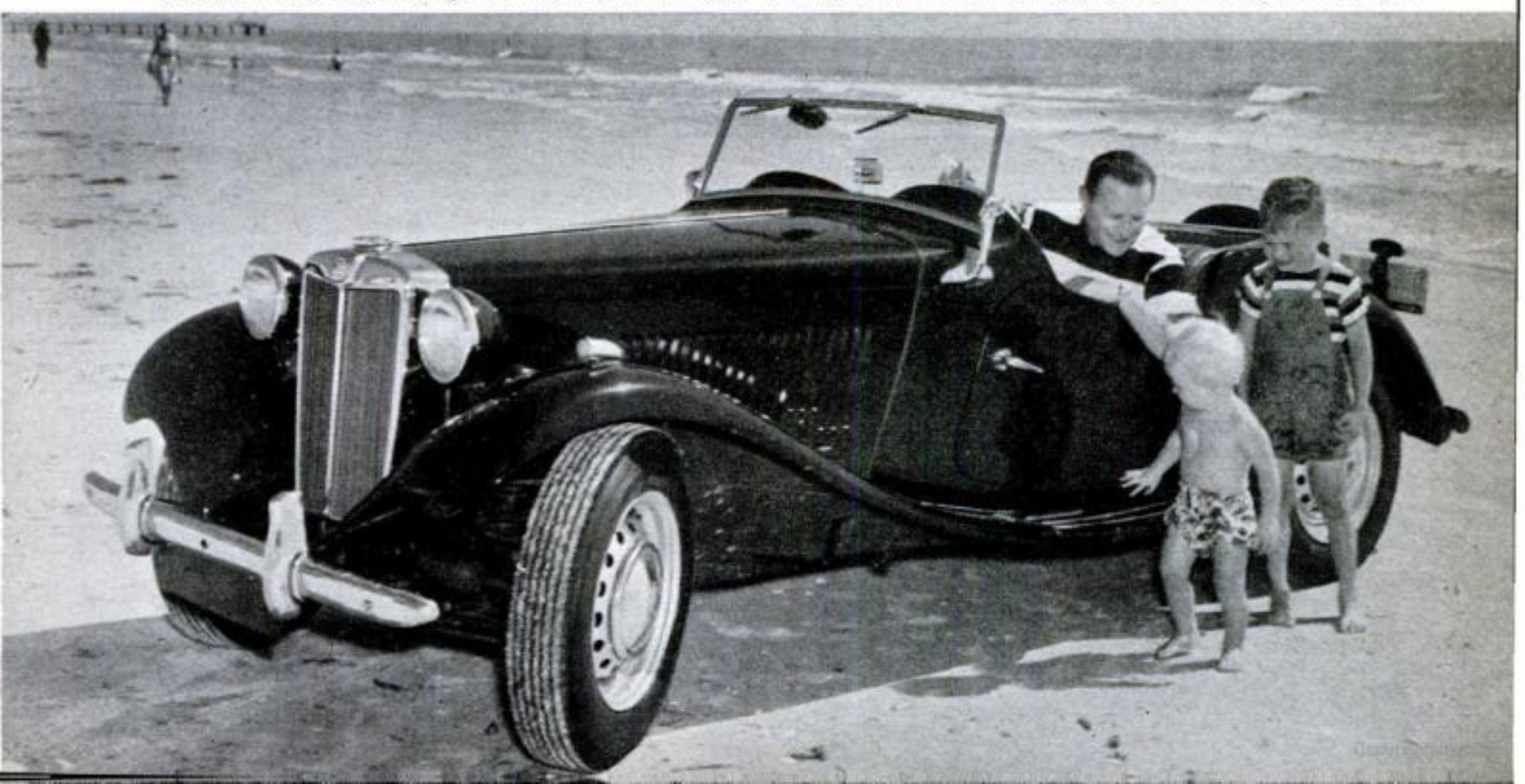
DRIVER'S SEAT...

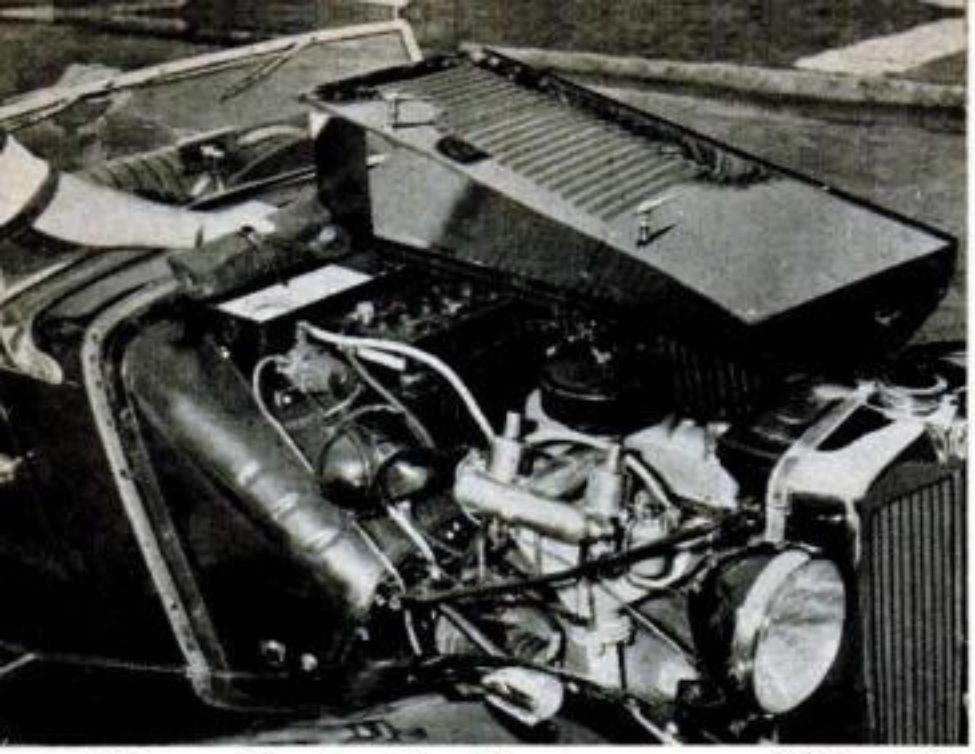
**By Wilbur Shaw**

THE MG, advertised by the manufacturer as the world's fastest small car, is more than a car. It's a cult. Driving it is like eating kumquats for breakfast. You have to know the rites.

This month I'm going to try to explain the MG cult—but I honestly wonder how far I'll get. The MG is far and away the most popu-

**The MG cult has no age limits. On the right is my son Bill who insisted on riding in this car.**





**The under-hood toolbox measures 22 by 4¾ inches. The manufacturer pays outstanding attention to mechanical detail. The two carburetors, for instance, have sleeve-type throttles instead of butterflies. The workmanship would be prohibitively costly on U. S. cars.**



**I've pulled up the hand brake here and have my fingers on the midget-size shift lever. The instrument panel has a tachometer and lights to indicate battery discharge and fuel shortage. The windshield wipers are electrical.**

**The pedals are tiny, measuring only 1¾ by 2¾ inches. The roller-type accelerator, snugged up against the transmission tunnel, is easy to miss with your right foot. I had a time finding a place to rest my clutch foot.**



lar sports car in the United States. It is also one of the most uncomfortable vehicles on four wheels. It rides hard. It's underpowered. It's cramped. (That, members of the cult tell me perversely, is why they like it!)

### *Small but Economical*

For export, it is being Americanized. The "dip switch" (light dimmer) is being transferred from the instrument panel to the toeboard. Of course, it's a left-hand drive.

Here's what I said on my recorder:

*Some people don't mind long trips in one of these things . . . but . . . there's no place to rest my clutch foot . . . the seat's snug, even for a medium-sized man . . . There's good steering-wheel clearance over my lap, though. The sun's hot . . . this is a solarium on wheels.*

I fired up. This involves pulling a button on the dash, or facia, as the British call it. The saucy little engine spoke up. The engine is economical, let's admit it. Depending on a driver's personal habits, he can get from 24 to 28 miles to the gallon in everyday motoring. If he's satisfied with 50 miles an hour on the open road, he can get as high as 30 miles to a gallon. If he's consistently heavy-footed, he will get 20 miles a gallon.



The low horsepower in the MG's engine is reflected in the gear ratios. The over-all ratio in first gear (counting in the rear-axle ratio) is 17.9 to 1. That compares with 9 to 1 for a Plymouth, 12 to 1 for a Chevrolet and 10.8 to 1 for a Ford. Here are the figures on second gear: MG 10.6 to 1, Plymouth 7.1 to 1, Chevrolet 6.9 to 1 and Ford 6.2 to 1. The MG's third gear, more comparable to our second gear, is 7 to 1. Its high is 5.125 to 1, compared with Plymouth's and Ford's 3.9 to 1 and Chevrolet's 4.11 to 1.

At 1,000 revolutions a minute the MG produces only 11 horsepower, at 4,000 only 47 horsepower, and it doesn't reach its maximum of 54.4 horsepower until 5,200 r.p.m.

*You have to keep driving this car . . . don't let your attention wander . . . the steering is extra-fast (the over-all steering*



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*ratio is 13.75 to 1; U.S. steering goes as high as 26 to 1) . . . acceleration requires a lot of shifting. You have to avoid bumps . . . every bump is a kick in the pants, the springing is that stiff.*

I found an open stretch of road and mashed the accelerator. It took a full mile and a half to get an absolute top-speed reading—82 miles an hour. That was without speedometer correction, but I had to admit it was pretty good for the horsepower.

My son Bill and I started for the beach, my wife tooling along behind us in the big convertible.

*I'll concede one thing . . . this car does get around . . . it can slip in and out of traffic like a greased eel . . . and the acceleration isn't bad. But, on the other hand, you feel every road shock in the wheel . . . that's due to rack-and-pinion steering instead of worm gears or rollers or cams . . .*

"Can't see mother," announced Bill.

The MG, darting in and out of the traffic, had brought us out on the open highway. My wife and the big car were caught somewhere back there on the highway. I parked.

"What do these cars sell for?" a voice suddenly questioned behind my shoulder.

I squared around. The expression on the face of my questioner was unmistakable: he was ready to buy the car on the spot. Before



I could reply that it sold for around $2,000, three or four other people appeared from nowhere and began to ask questions. They nosed around the instrument panel. One man opened and closed a door. Another one was down on his knees looking at the car's underpinnings.

Okay, *you* explain it.

At the beach I drove the MG down on the sand. My big car stayed on the road. It

**[Continued on page 228]**

# How to Understand English



IF YOU use the trafficators[1] on your saloon[2] conscientiously, handle the dip switch[3] with good manners and sport undented wings,[4] you are very possibly an expert driver. If you make a petrol[5] stop in the drophead[6] model and want to add air to the spare tyre, you must of course know whether to raise the bonnet,[7] hood,[8] boot[9] or screen.[10]

That's how the British motorist sometimes talks about cars. Sometimes he calls the dash a facia board, the hub caps nave plates and the defroster a demister. A radiator cover is a muff and the transmission is a gearbox.

If he mentions a strangler, it's not a Scotland Yard case but only the engine choke. Whereas if he says choke, he really means the venturi throat of a carburetor—oops, carburetter.

The English mechanic fastens a collar on a shaft with a grubscrew[11] and turns a spigot[12] on a piece to fit a socket. Naturally he uses a spanner[13] to tighten the sparking plugs[14] and is at times careful to leave one piece a few thousandths proud of[15] another.

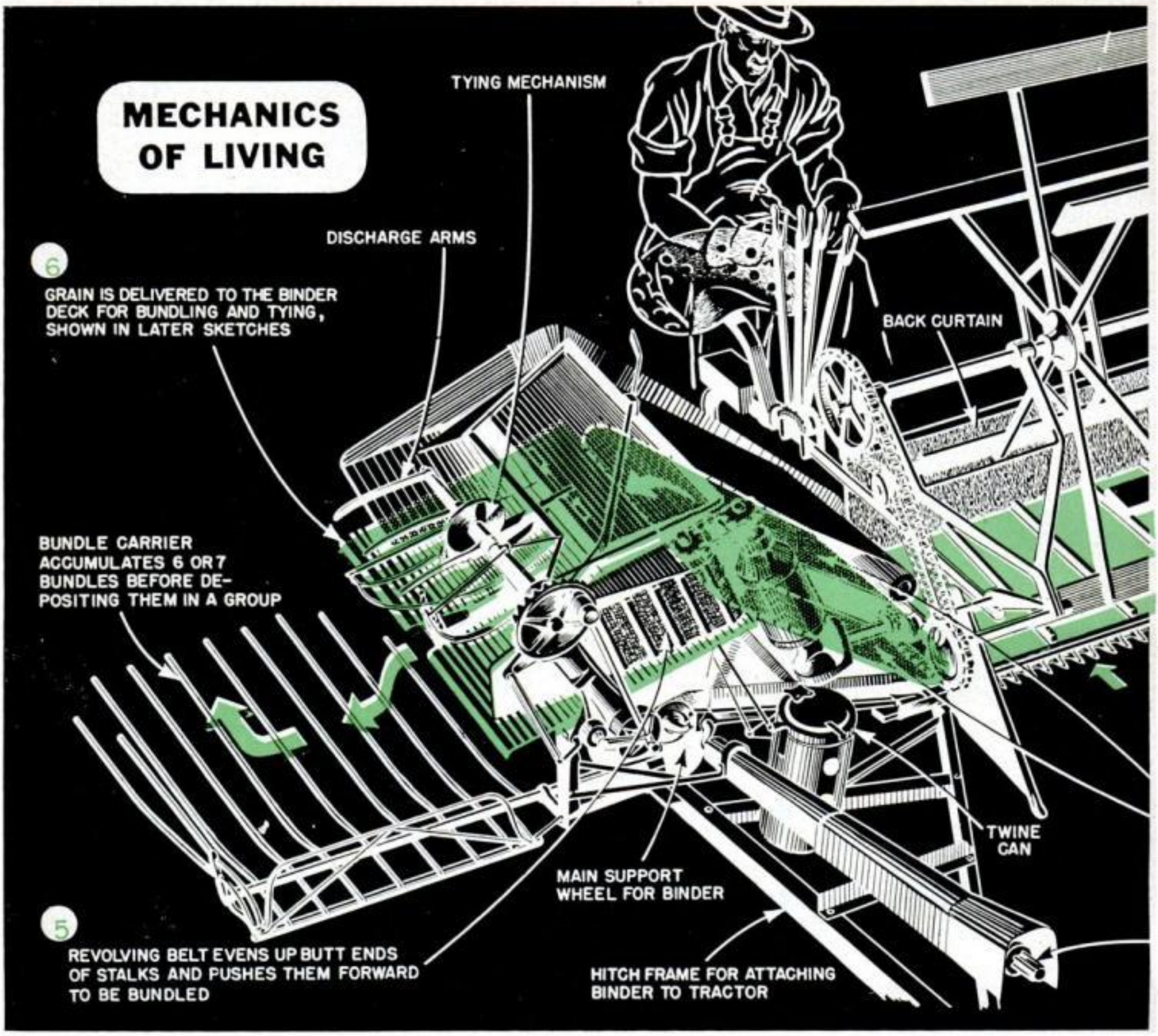
If you have defined 10 of these 15 keyed terms correctly, you have something to be proud of yourself.

—

*1. Turn indicators; 2. sedan; 3. dimmer switch; 4. fenders; 5. gasoline; 6. convertible; 7. hood; 8. top; 9. trunk; 10. windshield; 11. setscrew; 12. tenon; 13. wrench; 14. spark plugs; 15. protruding from.*



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# How a Grain Reaper



**THIS SLICK DESCENDANT** of Cyrus McCormick's original reaper, introduced to the world 121 years ago, is drawn by a tractor (left), which supplies it with power through a revolving shaft. The power take-off shaft operates at a constant speed regardless of the forward speed of the tractor.

**A FULL-FACE VIEW** (right) of intricate binder and tier, which is at the driver's right in drawing of McCormick-Deering reaper and binder above. This unit forms bundles of the cut grain, tall or short, then ties and knots them. Turn the page for detail drawings showing how machinery does these jobs.



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1 REVOLVING BATS DESCEND BEHIND STANDING GRAIN AND PULL IT EVENLY TOWARDS CUTTER BAR

OUTSIDE DIVIDER MAKES CLEAN SEPARATION BETWEEN CUT AND REMAINING GRAIN

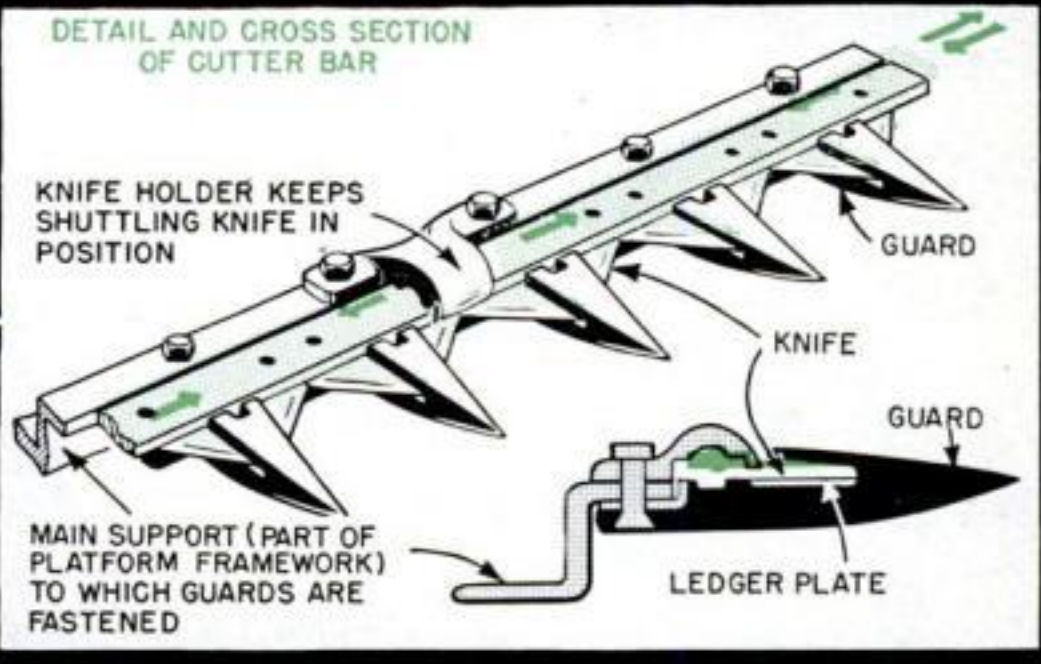
2 FORWARD MOTION OF BINDER BRINGS STANDING GRAIN AGAINST CUTTER BAR, WHOSE RAPIDLY SHUTTLING KNIFE CUTS IT AT PRE-SET HEIGHT

3 CONVEYOR-BELT PLATFORM CARRIES GRAIN TOWARD PROCESSING END OF BINDER AND DELIVERS IT TO UP-SLANTING CONVEYORS

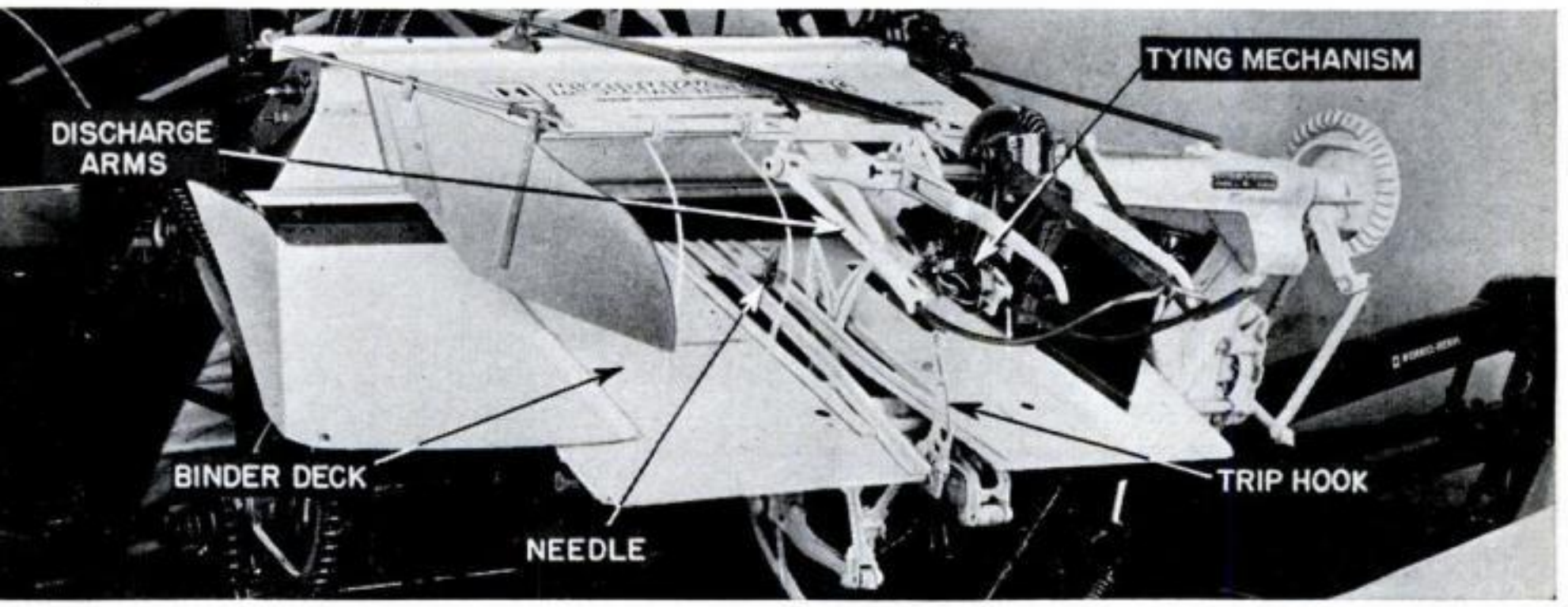
4 TWO CONVEYOR BELTS RAISE GRAIN FROM PLATFORM TO THE BINDER DECK

PROPELLER SHAFT WHICH CONNECTS WITH TRACTOR'S POWER DRIVE

DETAIL AND CROSS SECTION OF CUTTER BAR




# and Binder Works

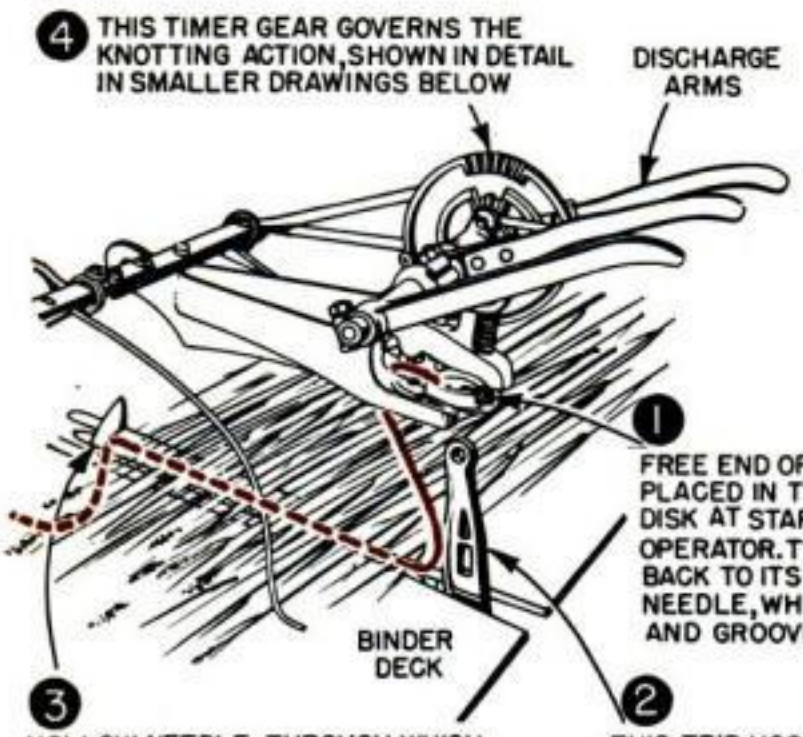




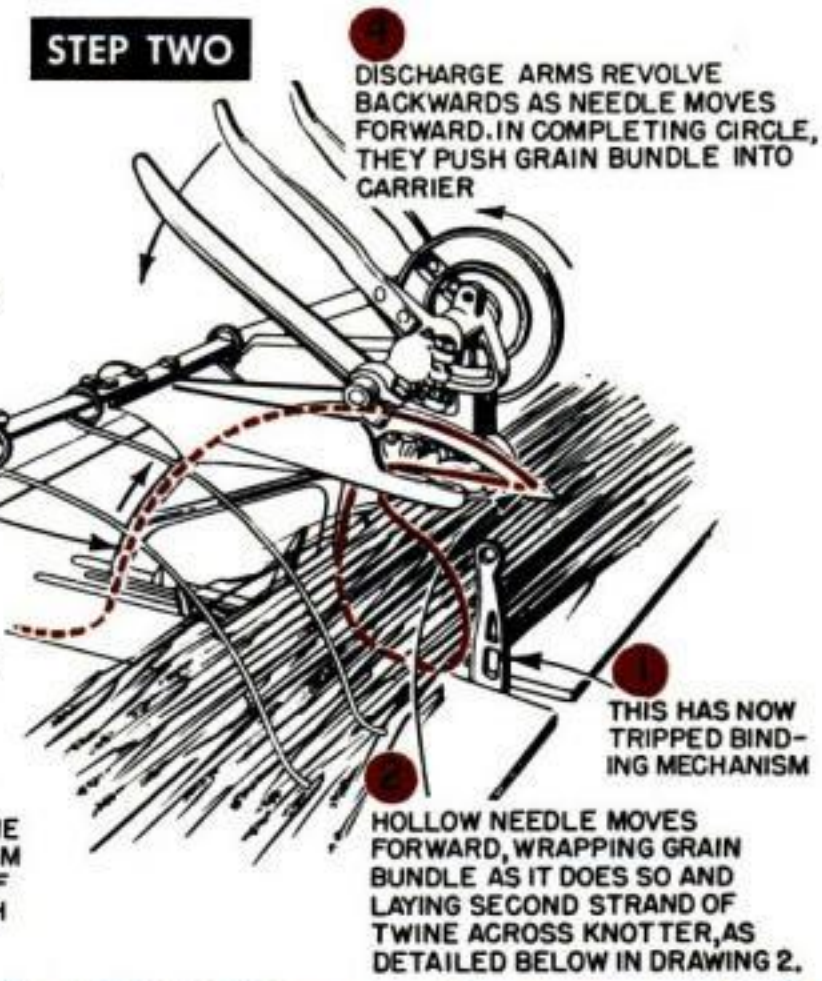

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## CONTINUED How Grain Binder Ties a Bundle

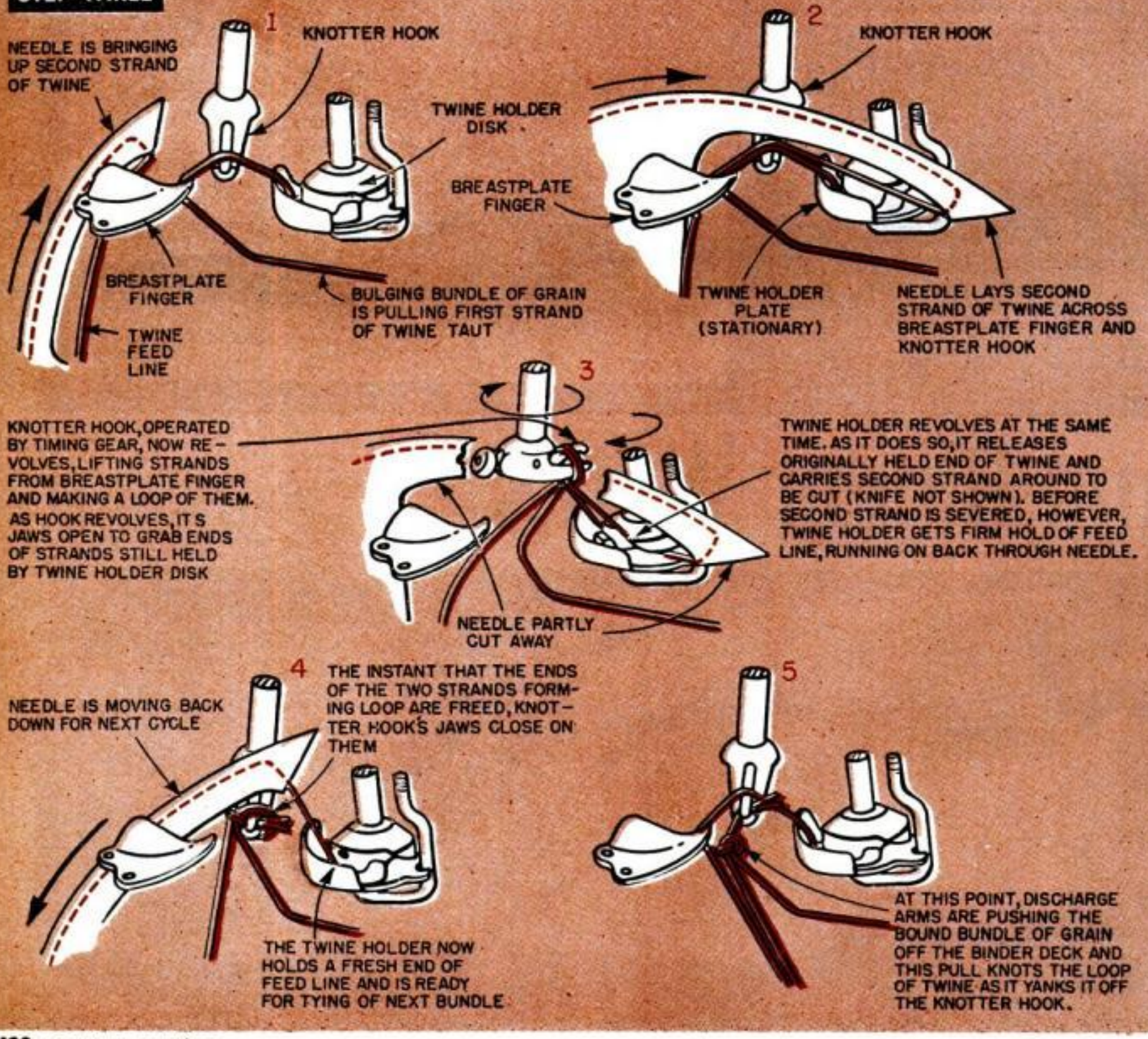
### STEP ONE




### STEP TWO

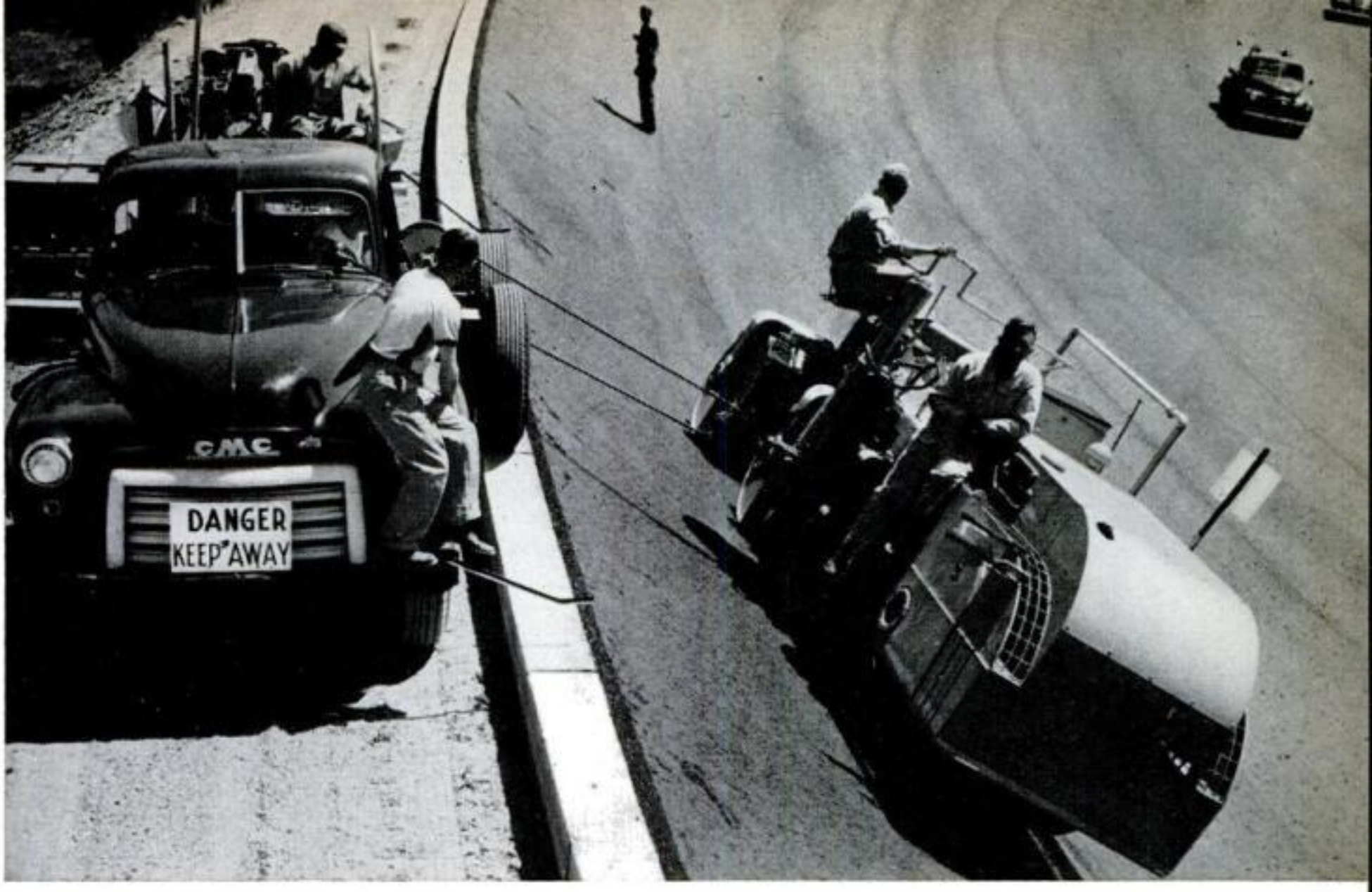



### STEP THREE






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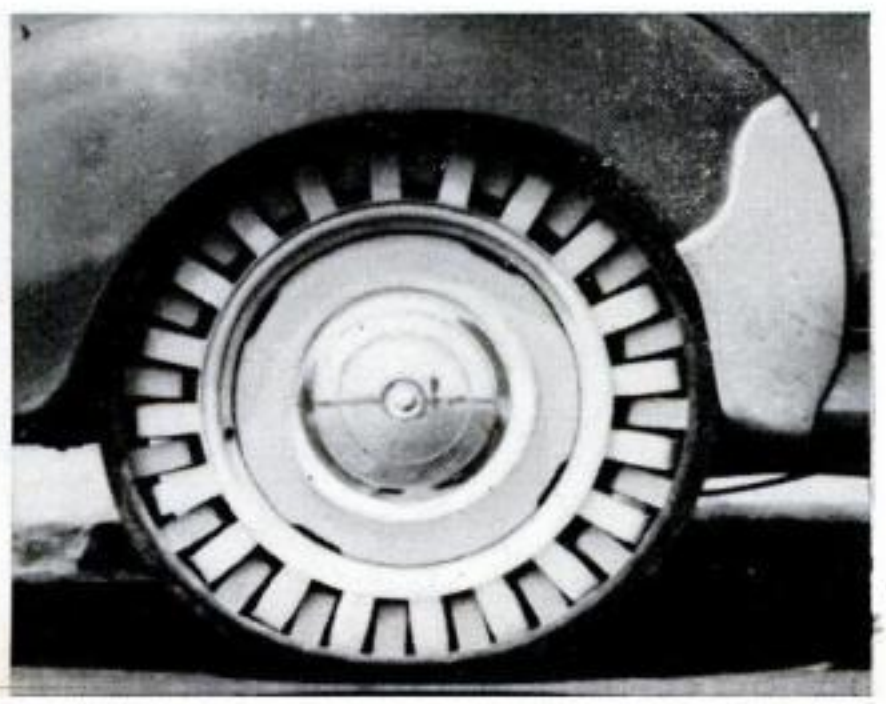



## Roadway Paved on a Slant

IN THE novel way pictured above, road builders solved the problem of repaving banked turns of a high-speed auto test track at Milford, Mich. Since the slope reaches a maximum of 37 degrees, so steep that it is difficult to walk up, the 11-ton roller had to be hung on cables from a special truck to smooth the paving mix. The truck has four extra wheels, two riding on top of a concrete curb and two bearing against its outside wall. A two-ton, cast-iron counterbalance on the truck's far side helps to keep it from overturning.

## Frenchman Puts Teeth in Tires

LUCIEN A. BERNARD of Arras, France, dreamed up a flexible wheel which he claims is punctureproof. Lugs of a solid rubber-like material attached alternately to an inner metal rim and an outer tire intermesh like gear teeth.






## 75 years ago this month

***Popular Science Monthly reported:***

"PROF. HEBRA, of Vienna, dissents from the generally-received opinions as to the benefits of frequent resort to the bath. His views on this subject, as set forth at some length in the *Boston Journal of Chemistry,* are to the following effect: It is not true that frequent bathing is conducive to health, and harmless. Millions of men take no baths of any kind, at most washing only the face and hands, and yet live to old age in good health."



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# P.S.

## Last minute news & notes...

EVEN IN -65° COLD, gasoline engines are started in 30 seconds by an attachment called a gasifier, originally designed for U.S. planes and now on trial for ground vehicles. The device is a precombustion chamber, with a spark plug of its own. It burns a part of the fuel, heating and vaporizing the rest on the way to the cylinders, and supplements the carburetor for starting only. The Robert Reichhelm Co. of Stratford, Conn., developed it.

FASTEST FLIGHT by man, 1,238 miles an hour, has been confirmed by the Navy. The speed record was made by the rocket-powered experimental Skyrocket, which at the same time set an altitude record of 79,494 feet.

HIGHEST SPEED ever given a projectile by man, 99.99994 percent as fast as light, is reached by electrons in a new Caltech synchrotron. Then they crash into a lead target and produce 460,000,000-volt X rays, the world's most powerful.

A BABY STAR only 2,500 miles in diameter--smaller than the earth--has just been discovered. Smallest known, and relatively near the earth, it belongs to the class called white dwarfs, which are noted for great density and hot surfaces.

JOLTS OF JUICE will free some power-transmission lines of ice this winter. When sleet forms on a wire and the weight threatens to snap it, a calculated overload of current is sent through it. Like the heating element in a toaster or iron, the wire gets hot, and the ice melts.

TEN NATIONS of continental Europe have set up a European Council for Nuclear Research and will build a $24,000,000 International Laboratory--possibly at a site offered by Switzerland, one of the member countries. The others are Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden and Yugoslavia.

A NEW TRANSMISSION for six-cylinder Chryslers pairs a torque converter with the semiautomatic gearbox used since 1941. The torque converter, a simplified version of the one in Chrysler and De Soto V-8s, is unique in that it shares the engine's oil system. While you have to buy 13 quarts at every oil change, Chrysler says that two changes a year are enough.

ARMY TELEPHONE and telegraph circuits now use an improved cable, providing 12 circuits instead of the previous four. Already carrying messages in Korea, the cable is suited to climates from the Arctic to the tropics, and heavy trucks can rumble over it without harming it.

INTERLINGUA, newly invented international language, borrows words from many tongues but sidesteps their intricacies of grammar. If you know a little French, Spanish or Italian, you can understand it at first sight, its advocates say. Sample: "Energia es necessari pro toto que occurre in le mundo." Translation: "Energy is necessary for everything that happens in the world."

A $10,000 REWARD is being offered by the American Humane Association of Albany, N.Y., for a "humane" small-animal trap. Executive Director Mel L. Morse says the reward is offered in an attempt to end the use of the steel trap, "one of the greatest cruelties to animals still remaining in our civilization." The prize-winning trap must either hold the animal unharmed or kill it instantly. Among other requirements, it must not damage the pelts of fur-bearing animals, and must be simple and cheap to make.

TRANSOCEANIC TV may not be so far off after all. A new discovery permits transmission up to a range of 1,250 miles, instead of the 50-mile distance previously considered the approximate limit.

*The Editors*



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MECHANICS and HANDICRAFT
REG. U. S. PAT. OFF.

# The Easy Way to Pave Your Yard

By Darrell Huff



***Concrete work doesn't necessarily call for a lot of elaborate forms and heavy work. Here's how to save your muscle—and your money.***

DON'T let them kid you about back-yard concrete work.

It doesn't *have* to be done the hard way. You can give your yard the convenience and good looks of garden paths and terraces, and without back-breaking labor.

The approach that lets you do it the easy way is shown in these pictures. This is not the standard procedure for concrete work. But it will cut your work in half.

It is a method I finally came to after considerable experience in paving the traditional—hard—way.

Mind you, I'm not quarreling with the



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standard specifications for concrete work. Paving, to meet all conditions, must be done to specifications. A driveway, for instance, that may carry several tons of truck must be thick and well based.

But what is nonsense is the common practice of applying these standards and requirements to a garden path or a terrace where you plan to put nothing heavier than a chair or a table or yourself.

Sure, there are other problems. Tree roots can crack concrete. Frost in the ground can heave and break it. The standard answer to this—and it doesn't always work, either—is a lot of fill plus thick concrete. But let's take a look at the four elements that make standard concrete work tough for the home handyman. And let's see how my system gets around all of them.

These four things are: leveling the ground; putting in fill, building forms heavy enough to be level and rigid, mixing and placing enough concrete to make a slab 4″ thick.

To begin with, we *don't* level the ground. We let the paths and terraces follow natural contours, doing just enough shovel work to smooth out bumps.

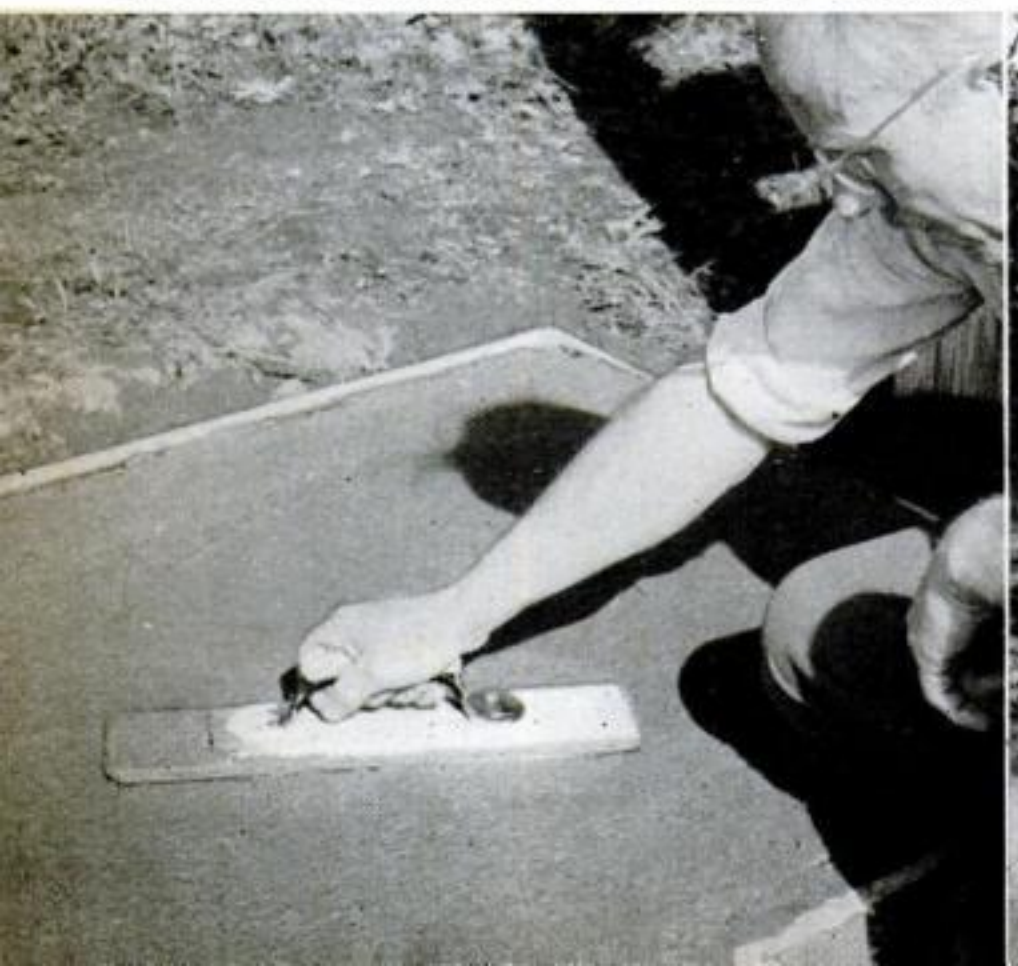


**FORMS** are pieces of scrap lumber that were ripped into 2″ widths. A few nails at the intersections and a few stakes are all we use.



**LEVEL** is needed to make sure terrace pitches in direction water should drain. Lumber that made side forms for path is being reused here.

**FLOAT** is used next to smooth out depressions left by strike board. Float can be made from a smooth board and a screen-door handle.



**AFTER CONCRETE** has set for a while trowel is applied to give it a fairly smooth finish. We don't bother trying to get a really fine finish.



We *don't* put in heavy forms rigidly staked. We use curves most of the time instead of straight lines. Our forms are ultra-light but still need only occasional staking down. This means pennies instead of dollars for form lumber.

We *don't* use any fill, except where the soil drains badly, because fill adds a lot of work. How do we get away with this? Well, that's the secret of the whole job.

Instead of making continuous walks and big slabs, we convert our whole job into a series of simple stepping stones.

All the forms are broken up into small rectangles by strips of lumber which are left in place permanently. The garden path is a series of rectangles averaging 2′ by 3′. For a terrace, we cast in place concrete "flagstones" 3′ or so square.

The result: if heaving occurs from roots or freezing, each rectangle of concrete will move independently. It can settle back later (or be put back, if necessary) without a crack forming.

The wood dividers also act as expansion joints. All the form lumber can be ordinary nominal-inch-thick stock. If fairly sharp curves are wanted, the lumber must be



**GARDEN RAKE** spreads the concrete. Use of small squares makes it easy to interrupt work and begin another day without a bad joint.



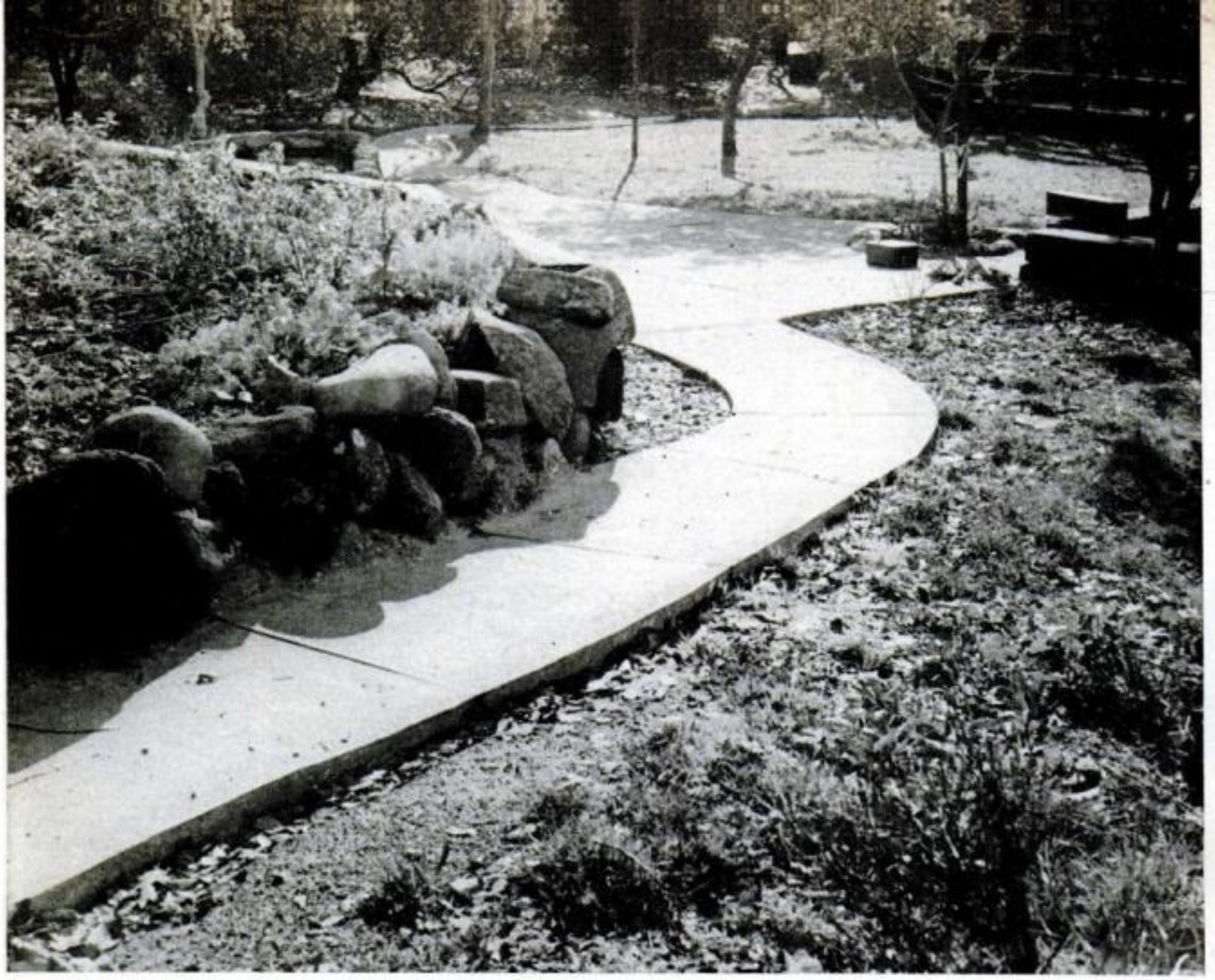
**BOARD** serves as screed, or strike, to level wet concrete with tops of forms. Board is moved back and forth across forms at same time.

**BROOM** adds texture to concrete. This is done several hours later when broom will barely roughen surface. Parallel strokes are used.



**FINISHED CONCRETE** can be painted to make an outdoor game room for checkers, hopscotch, shuffleboard or whatever you like.





**Paved paths are mudless communication routes between our house, pool and kids' play area.**

thinner. For a walk-and-terrace job, you can use ½" lumber of the cheapest grade and get quite strong curves. I used redwood because it's cheap where I live and will last a long time.

Fir or pine will decay soon, but that's all right. When the strips go, push in a little topsoil and encourage grass between the blocks of concrete. Or leave the openings.

And finally, we *don't* pour a slab 4" thick. We can get away with making it only half that thick because our job consists of such small units.

So there is the economy: only about half the usual amount of cement and gravel to buy, only half the mixing and carrying to do.

We found it simplest to make concrete in a small mixer powered by an electric motor. Such mixers are widely available for rental by the day.

You simply rent a mixer, have sand and gravel and some sacks of cement delivered, and pitch in. Your mix consists of one shovelful of cement to five or so of the half-and-half sand-and-gravel mixture, plus enough water to permit thorough mixing and easy handling. If you get your proportions a little wrong your concrete may not meet professional standards—but you'll still get good garden paths.

Even in the final step we avoided almost entirely one of the bugaboos of amateur cement workers: troweling to a fine finish. We merely rough-troweled to a sort of semi-finish that is easy to get, and then broomed the surface. The result was a lot of labor saved and a surface that is neat and attractive. And there's an extra dividend—the broomed surface is practically slipproof whether wet or dry. END

***Next Month: What you can do to make sure your water pipes won't freeze this winter.***

## Workshop Wisdom



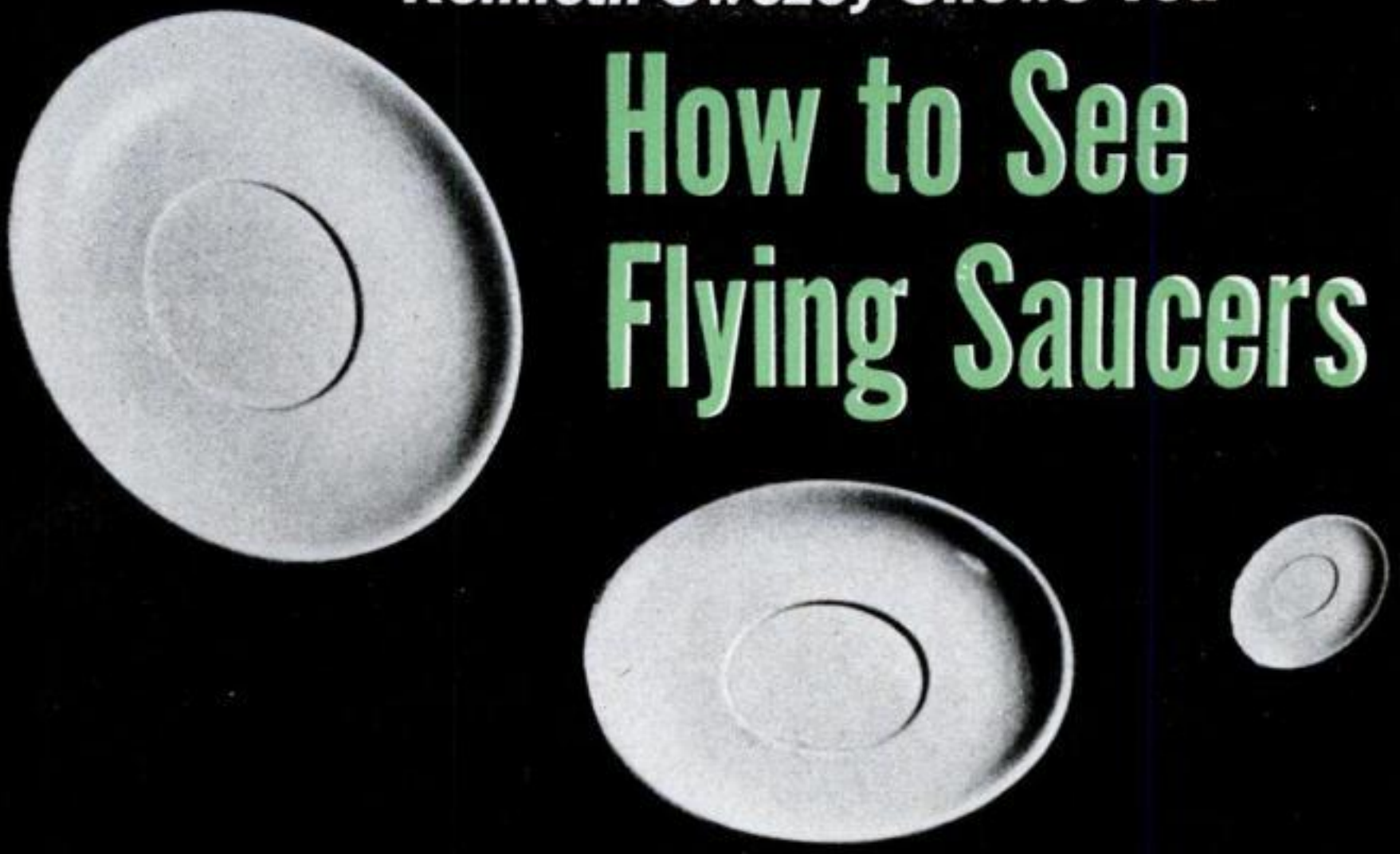
***Much missed is the laughter of Muckles,***
***A lathe hand once given to chuckles,***
***Till he had a yearning***
***To stop a chuck turning***
***By deftly inserting his knuckles.***



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## Kenneth Swezey Shows You

# How to See Flying Saucers



**Can you guess** which of these kitchen saucers was farthest from Ken Swezey's camera and which nearest when he made this trick picture? Here's a tip: the photo was shot to demonstrate that unless you know the size of an unfamiliar object outlined against the sky, you can't judge its distance, and until you know its distance you can't possibly judge its speed. After making your guess, turn to the end of the story to see the answer.

***Kitchen-table tricks suggest that those strange sights in the sky may be just optical illusions—and nothing more.***

YOU don't have to stay up all night sky-gazing to catch a glimpse of some flying saucers. You can see them right in your own home, using just a milk bottle filled with water, a flashlight and a few other common gadgets.

Flying saucers that cannot be accounted for as pure hoaxes or as misinterpretations of known objects are not *necessarily* spaceships or missiles from another world. Dr. Donald H. Menzel, professor of astrophysics at Harvard, declares that they may be mere optical illusions—akin to mirages and rainbows—projected into the sky by tricks of light. You can duplicate these tricks on a small scale.

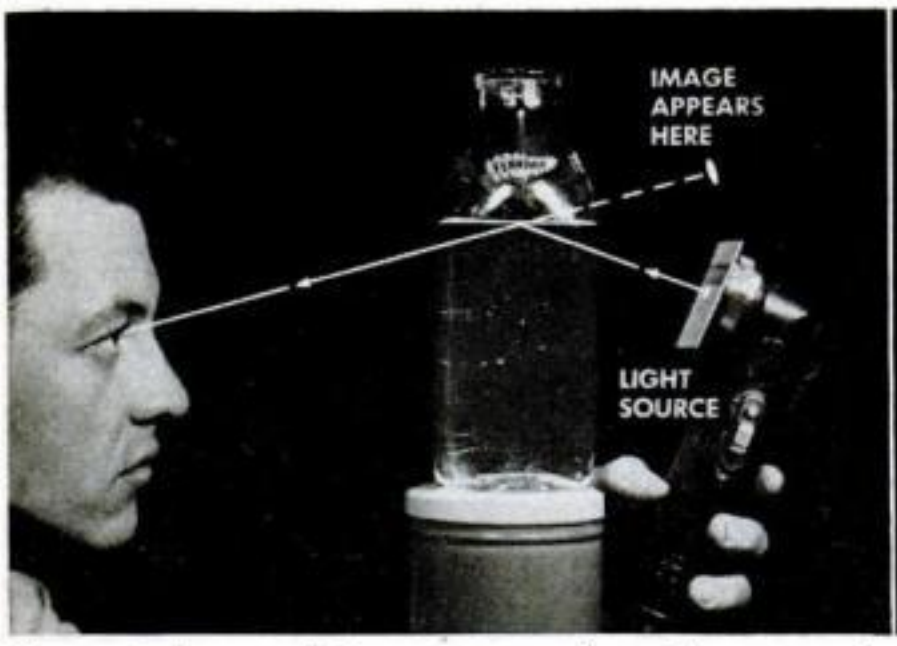
In some cases, the sky phenomena may originate as automobile headlights, searchlights or distant street lights. Striking a layer of warm air above, the rays from these sources are bent downward toward the earth. To an observer on the ground, this bending of the rays makes the light source seem to be overhead.

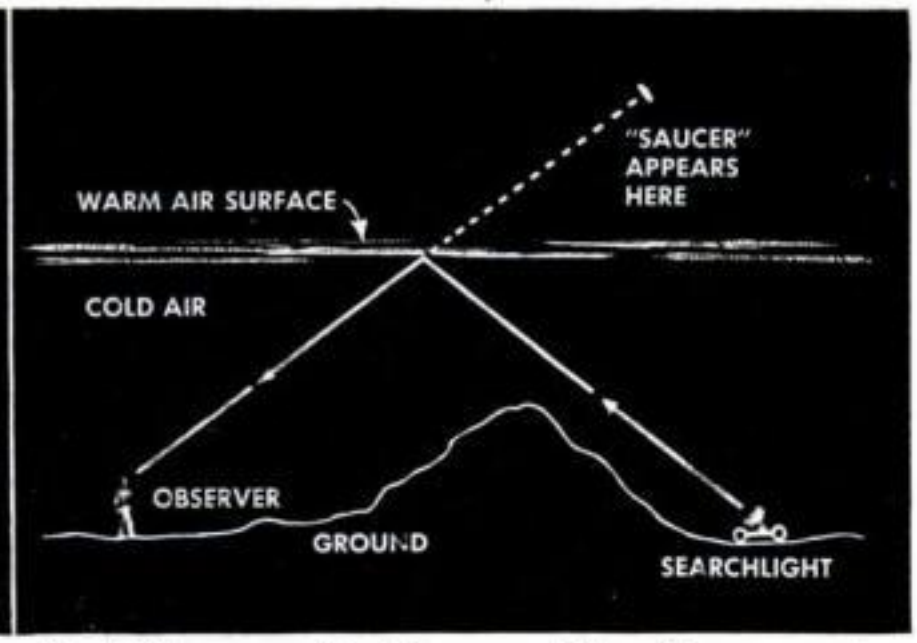
In other cases, a pilot flying above a warm layer of air sees the light from the sun, a planet or a brightly lighted cloud bent upward. Such a light seems below him. The ghost light might seem to move if its source—or the observer or the layer of warm air—moves.

Flying saucers are probably seen most frequently over desert areas because the atmospheric conditions necessary to produce these strange mirages are most common there. During the day, the air and the



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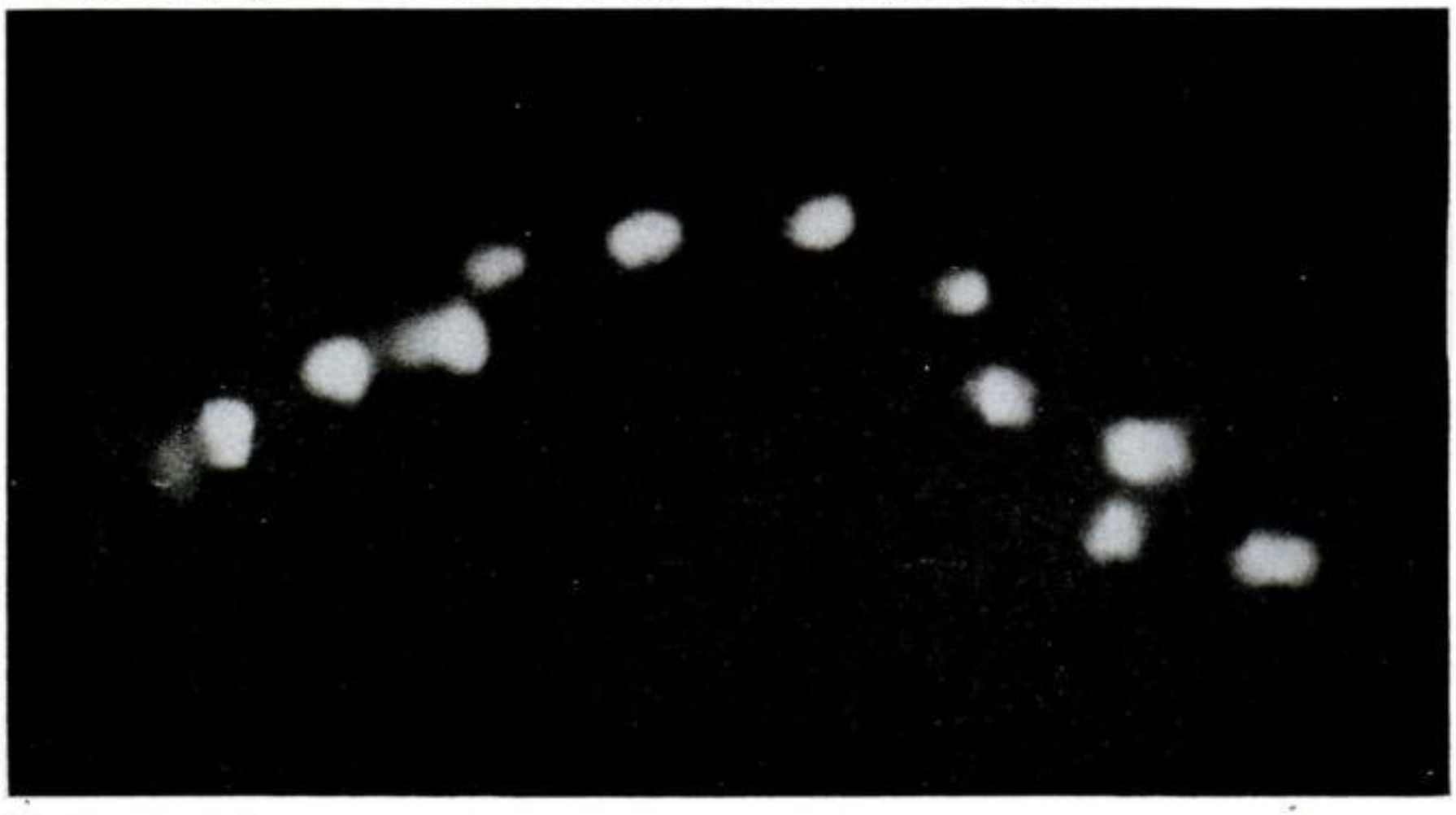

**You might see flying saucers** from the ground as demonstrated here. A square milk bottle containing water is supported high enough so that you can see the underside of the water surface. The beam from a ¼" hole in cardboard covering the flashlight, aimed at the center of the water surface at an angle from below, is bent downward to the eye of the observer. As a result, the light seems to be coming from above the surface of the water. In the same way, although less abruptly, a warm air surface above cold air could bend back a distant ground light so that from the ground it would look like a saucer in the sky.

ground get very hot. At night, and also under certain cloud conditions during the day, the ground cools rapidly by radiating its heat toward the sky. As a result, the air for a few feet up cools off by contact with the cool earth, but the air higher up stays warm.

Because light rays travel faster in light warm air than they do in cold dense air, they are bent back into the cold air whenever they strike the layer of warm air at an angle.

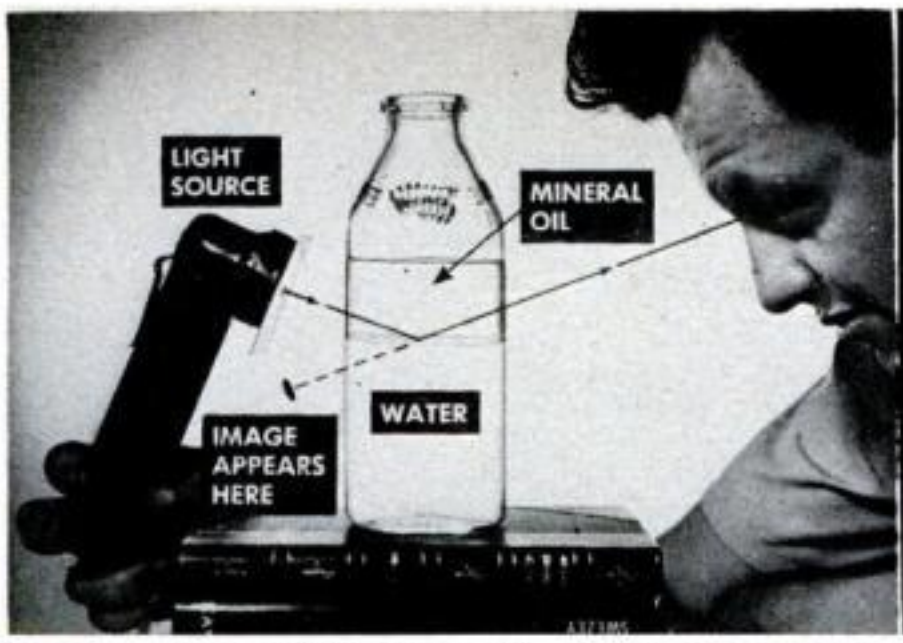
You can't experiment with miles of atmosphere in your home, but you can show the principle by substituting water for the cold dense air and ordinary air for the warm light air, as shown by the illustrations on these pages.—*Kenneth M. Swezey.*

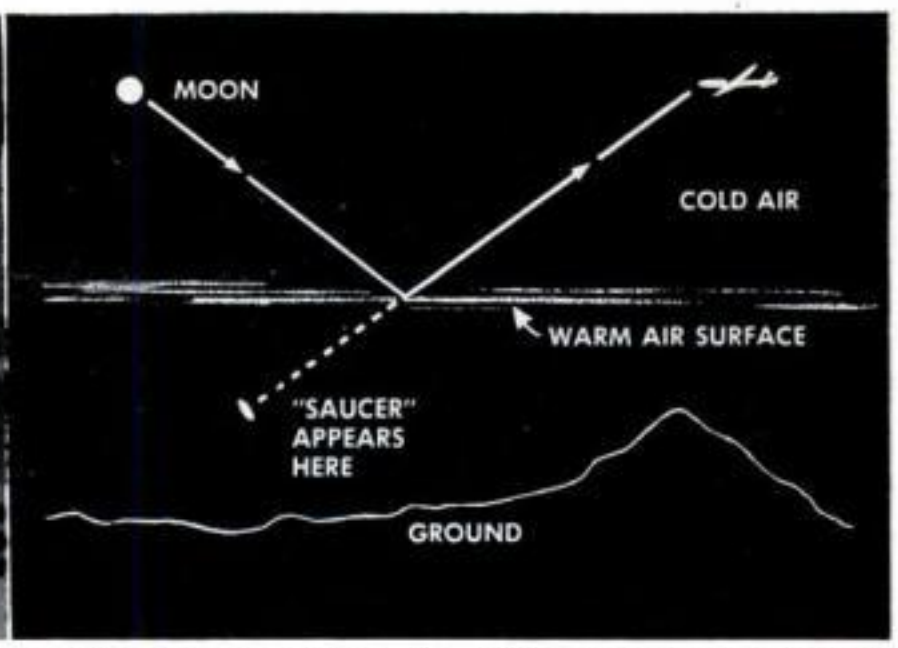
**Duplicate of the Lubbock Lights** was photographed by Swezey with the milk-bottle setup shown at top of page. In this case, a pattern of pinholes was punched in the cardboard covering on the flashlight. Dr. Menzel claims that the flying saucers photographed in the Texas city were probably ghosts of distant street lights turned down by a warm air surface as explained above. Undulations in the surface made them move. Lights viewed through a milk bottle can be made to dance around by jarring the bottle. But how a mirage like this could make such lights travel across the sky has yet to be explained by the experts.



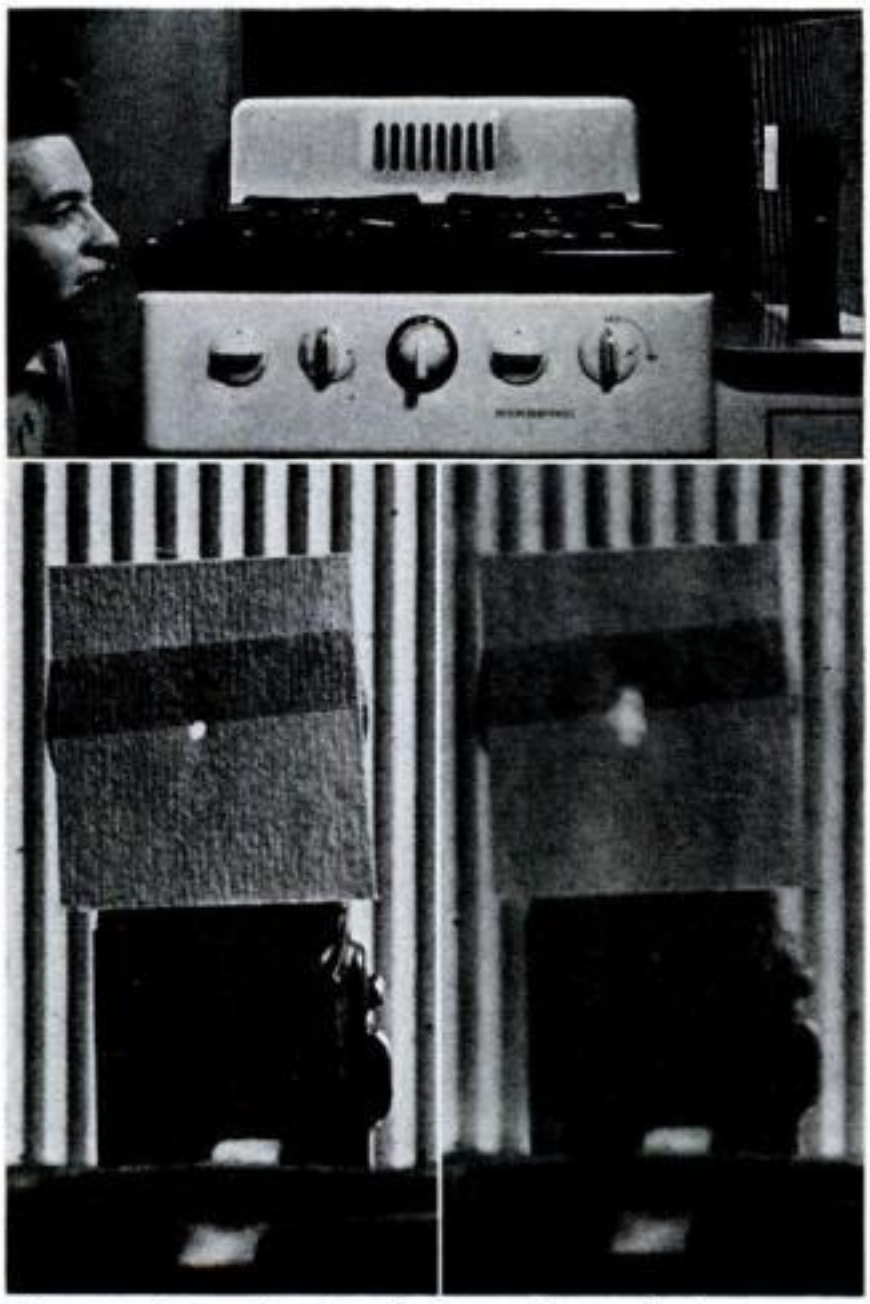


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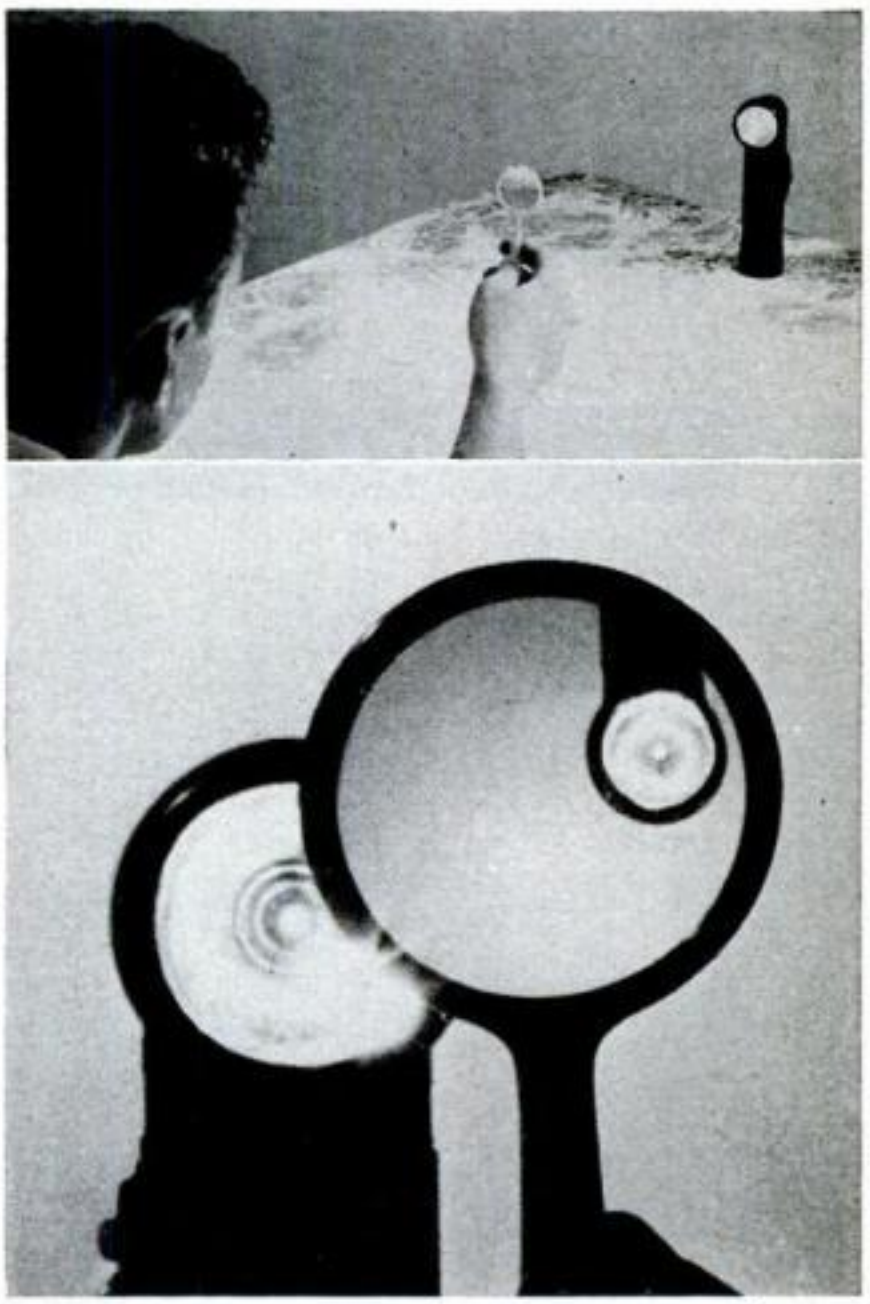




**From a plane** flying in cold air above a layer of warm air, you might see saucers below you this way. In this case, less water is put into the bottle and a layer of mineral oil is then carefully poured on it. Mineral oil bends light more than water does. When the flashlight beam is viewed as shown in the photo it seems lower than the reflecting surface.



**Fluctuations in air density** distort light waves. To see this, stand your masked flashlight on one side of a gas range and sight across the unlighted burners as the top photo shows. The lighted hole and background will be sharp and clear, as at lower left. When you light the gas, the waves of irregularly heated air bend the light waves, distorting them as at the right and causing the light to seem to blink on and off and move around.

Rapid fluctuations in a warm air surface could also explain why "saucers" seem to dart about. Moreover, irregularities in the reflecting surface might produce extra images from a single source of light.

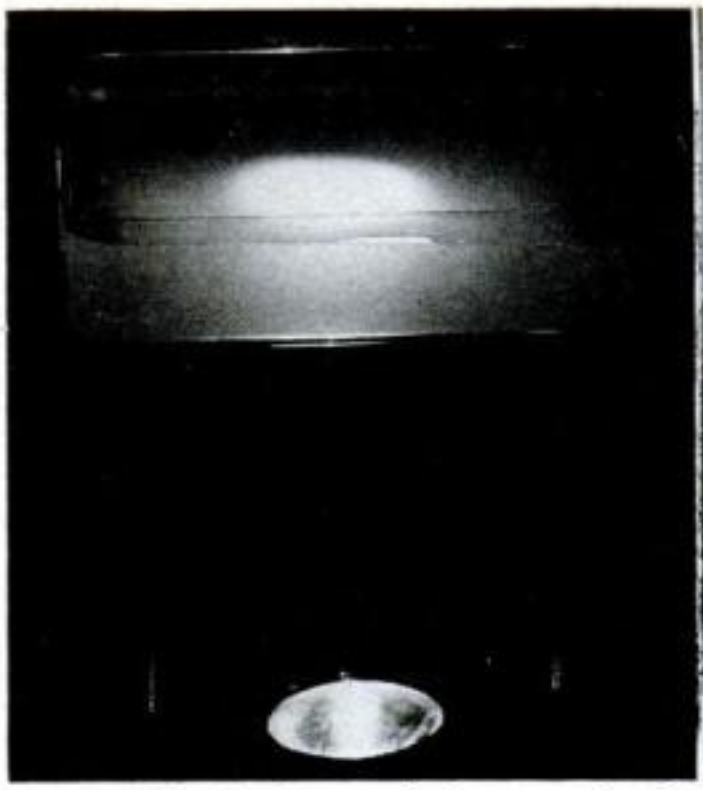


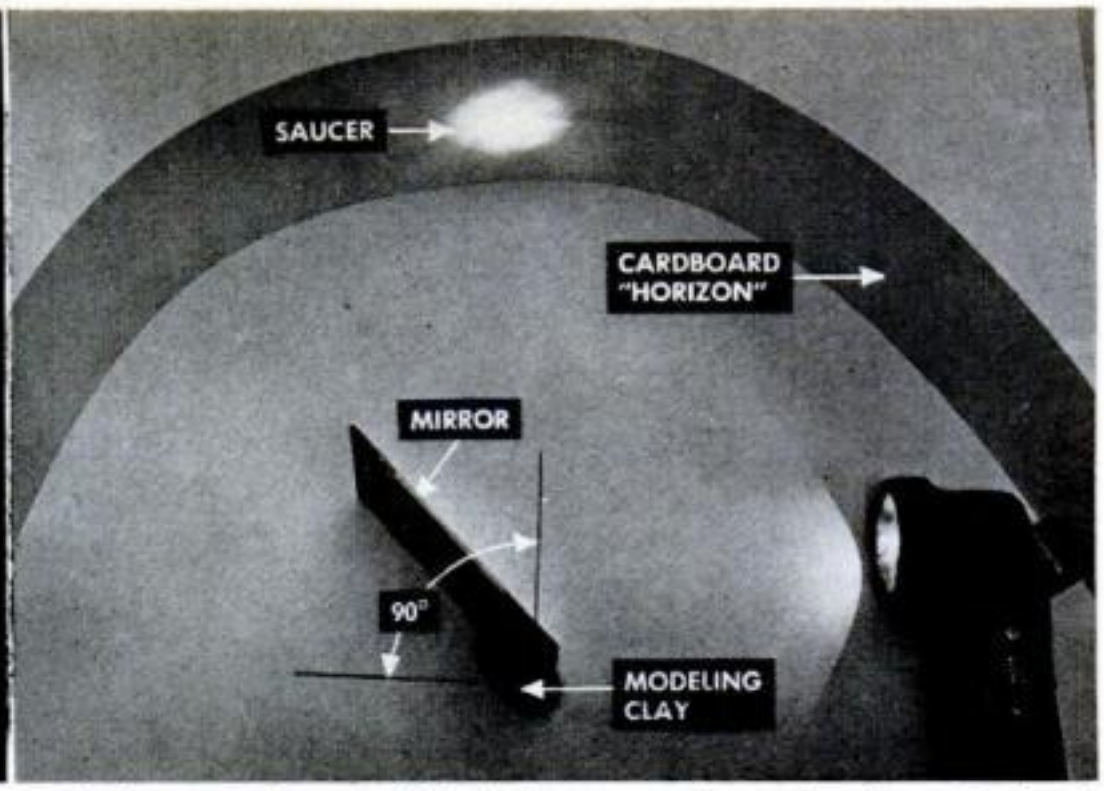
**A lens theory** may explain saucers seen darting around at great heights after launching of weather balloons. This theory pre-supposes a layer of warm air sandwiched between two cold layers. Rising balloon punches hole through warm layer, allowing cold air from above to flow into hole and forming a sort of imperfect lens. By holding a small magnifying glass at arm's length toward flashlight, you can see what then happens. Through the glass you see a small image of the light. In the balloon case, the air lens also forms image of balloon. Being smaller, it seems much farther away than the balloon. Changes in the lens shape could cause image to dart around.

***Please turn the page for more on saucers.***

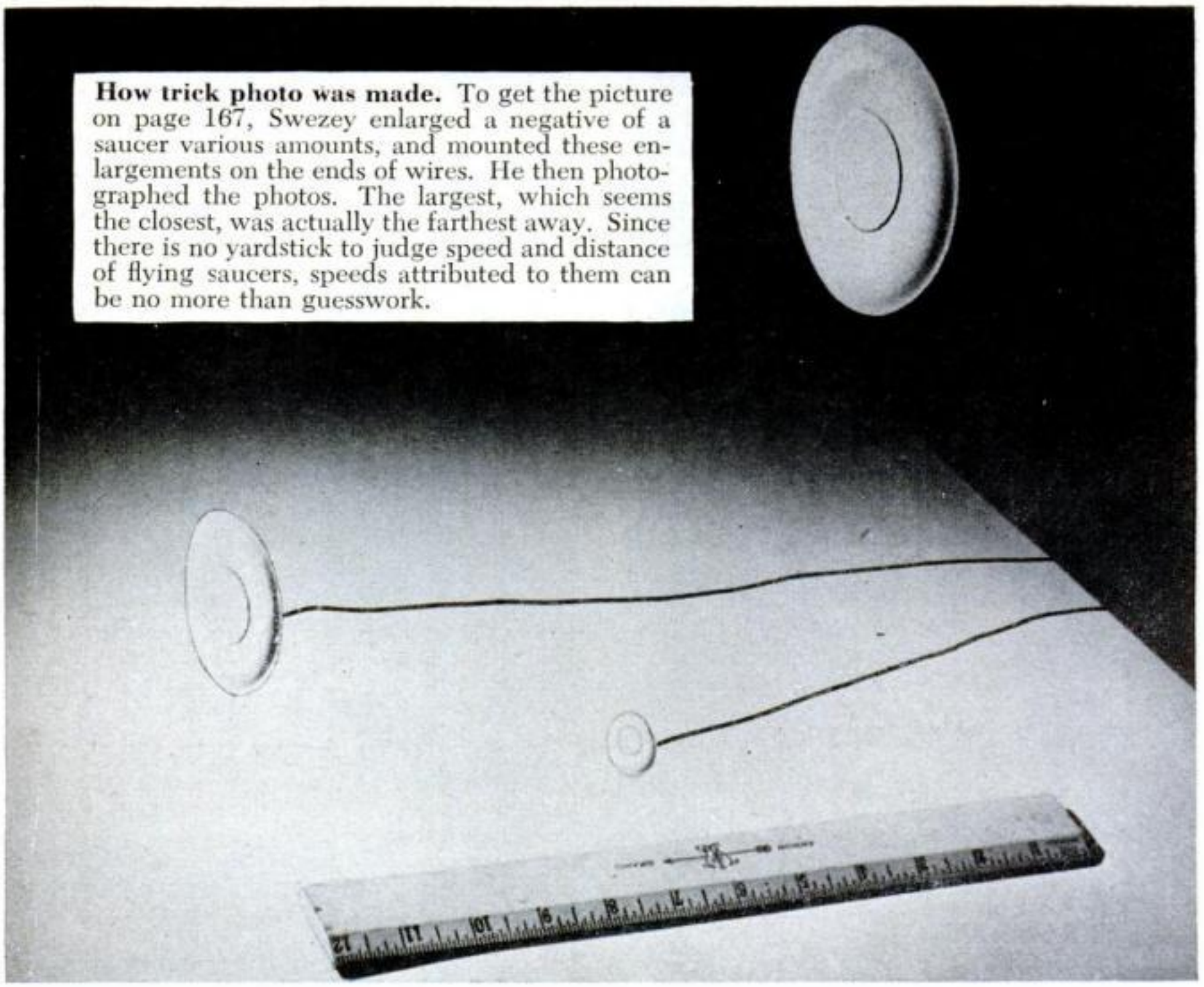


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**A searchlight beam** lights up clouds and dust layers because they reflect and scatter the light. The beam itself will be invisible if the air between earth and clouds is clear and dust free. You can see this effect by shining flashlight through bottom of a glass dish containing water to which a little milk has been added (left above). In some cases, what appears to be a flying saucer might be merely a searchlight or headlamp beam sweeping across a cloud layer at night or a reflection of sun by a mirror or other polished object on layer by day. In both cases, the light could cross sky in a fraction of second. A mirror or other reflecting surface could send a beam through the whole journey by moving only half as much as the original light source. The above setup shows how this would work. The "horizon" is a semicircular strip of cardboard set on edge. By rotating the mirror through only 90° you can cause the reflected light to move from horizon to horizon—or a full 180°.



**How trick photo was made.** To get the picture on page 167, Swezey enlarged a negative of a saucer various amounts, and mounted these enlargements on the ends of wires. He then photographed the photos. The largest, which seems the closest, was actually the farthest away. Since there is no yardstick to judge speed and distance of flying saucers, speeds attributed to them can be no more than guesswork.



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# Radical New Speaker Gives Hi-Fi for $30

JUST by drilling holes in the cabinet, two sound engineers have made an acoustic unit using cheap, small speakers sound as good as a costly big job. The holes do the trick by "tuning" the cabinet and baffle to compensate for inadequacies in the four 5″ speakers. Calculating the hole size and spacing was so complicated that an electronic computer was used to figure it out, report the inventors, Dr. Jordan J. Baruch and Henry C. Lang of Massachusetts Institute of Technology.

Dr. Baruch and Lang say that their unit, with two watts of amplifier output, reproduces the tonal range and volume of a full symphony orchestra. It is said to be "flat" (accurately imitating the original loudness) over a frequency range of 40 to 11,000 cycles, which covers most tones audible to the human ear.

The Baruch-Lang speaker, small enough to fit on an end table, promises to bring out the full quality which is inherent in FM radio and TV sound, but which now is often distorted by inadequate speakers. It will be marketed by Ultrasonic Corp., Cambridge, Mass., for less than $30.

## Polaroid Camera Improved



REFINEMENTS have been added to the Polaroid camera to suit press photographers and advanced amateurs. These include a 5″ f/4.5 Raptar coated lens, speeds from one to 1/400 second, a coupled range finder, a combination optical and frame finder, and flash synchronization. The new Pathfinder uses the same film as the regular Polaroid Land camera, delivering a print in a minute. Price: $249.50.



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# How to Measure Gas Mileage

***In this rig, a peanut-butter jar feeds a measured amount of gas—***

**By E. F. Lindsley**

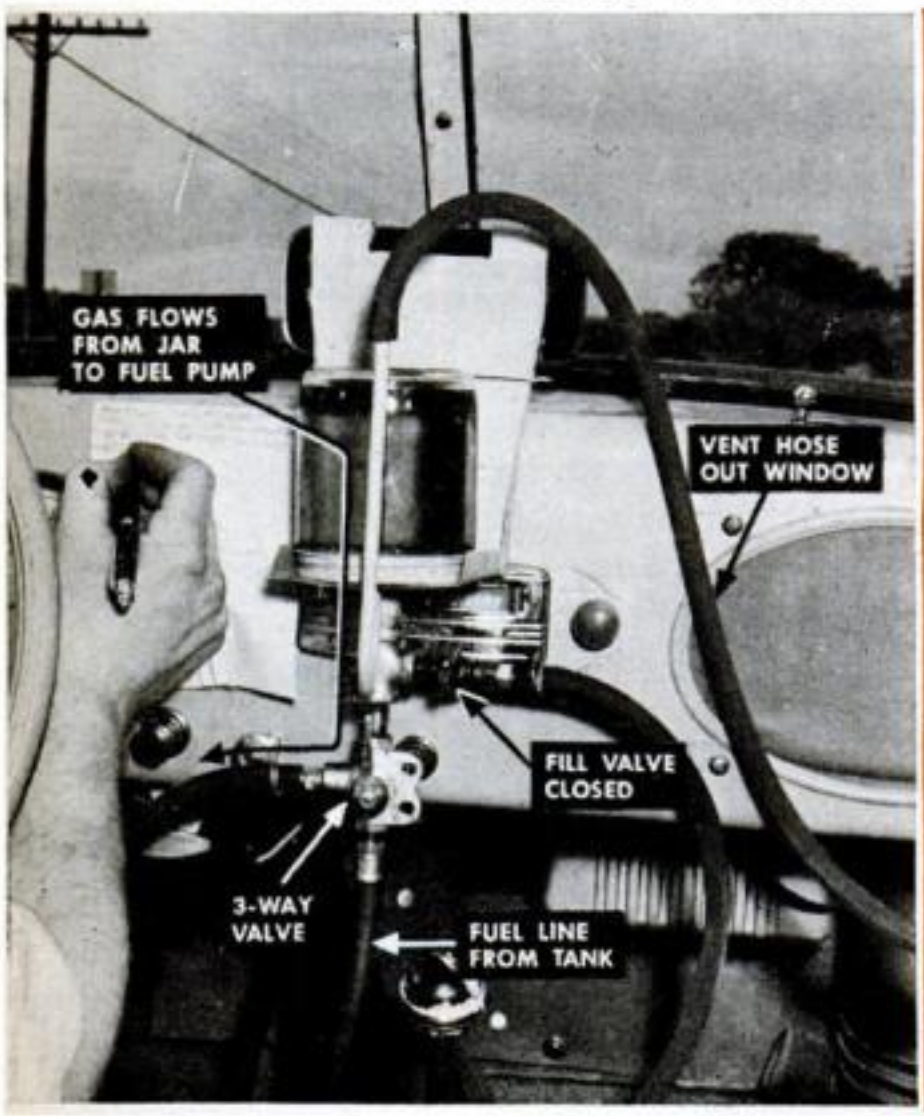
FREQUENT visits to the filling station were giving me the feeling that my car was not living up to the rosy picture of many miles and few gallons promised by its manufacturer. So I built a little mileage measurer to give me the dope, right from the mouth of the carburetor, on how much gas I use to go how far.

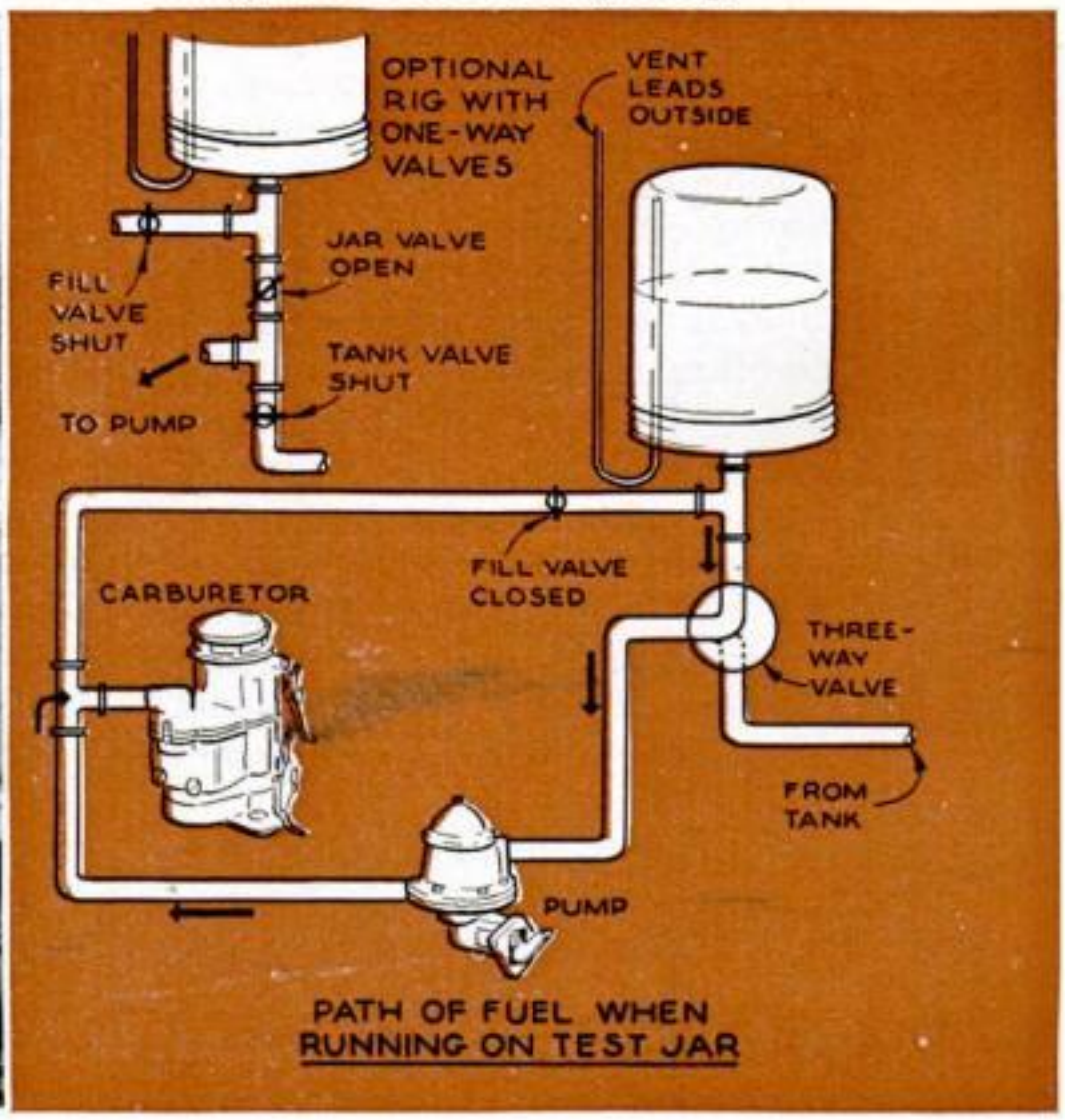
Conventional mileage checks, attempted by topping the tank and recording the miles to the next topping, are often wildly wrong. Operating conditions, including traffic, wind, stops, road surfaces and varied engine temperatures, introduce enough variables to make two and two come out to three. Other sources of error include tilt of the ground at the gas pump, spillage, and "blown-up gas" bought in midday heat.

***A special test rig*** is the answer. It lets you make controlled short runs, avoiding abnormal road conditions, and it eliminates human or mechanical errors at the gas pump. But a simple gravity-feed measurer—a jar that drains into the carburetor—doesn't really do the job right. The carburetor float valve behaves differently against a random gravity head than it does when bucking fuel-pump pressure.

You need a rig that feeds the carb through the fuel pump so that the test par-

**BEGINNING OF TEST.** Writer notes mileage on pad after filling the measuring bowl. Hose from vent tube runs out window to carry off fumes and possible overflow of fuel that occurs if fill valve is not closed at moment jar is full. Vent hose also admits air as fuel is pumped out. Gas fumes can be dynamite, so make all connections snug, and don't smoke during test. Jar lid should have heavy gasket of cork or neoprene cork, set in gasket cement; don't trust original seal. Vent tube and outlet fitting were soldered to jar top.






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# Accurately

***and your fuel pump refills it.***

allels normal operation. My peanut-butter jar and gas-valve outfit does just that. What's more, the outfit only cost two bucks, and I ate the peanut butter, too.

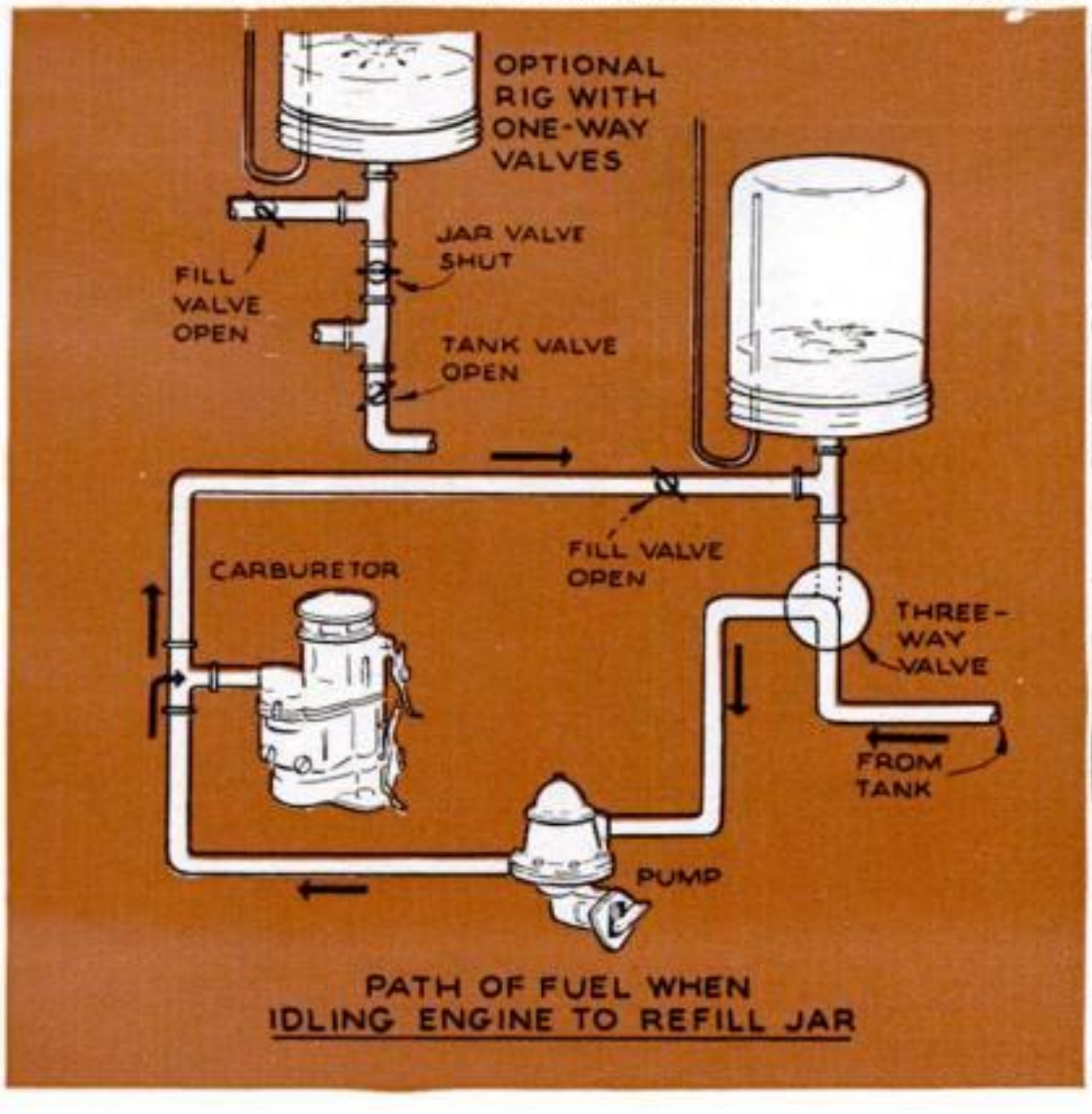
With the measurer to tip me off, I no longer have to kid myself that "This last adjustment will put her right on the nose." It lets me *see* the results of changing the carb jets or timing. It shows up differences in fuel mileage caused by driving habits, speed, tire pressure and even the wind.

The 13-ounce jar comes close to 12.8 ounces (one-tenth of a 128-ounce gallon) when the vent tube and gasket are in place. I fill it to capacity so that I don't have to sight across a calibration line while fuel



**A GLASS JAR WITH SCREW-ON TOP is checked with measured amount of liquid. Peanut-butter jar holds 13 ounces. One-tenth gallon is 12.8 ounces. Air vent, heavy gasket and slight bubble at top subtract difference. Jar is put in rig empty, filled by gas pump.**

**AT END OF TEST RUN, mileage is recorded just as last drops of fuel run out of jar. It must be done at this instant; driving on gas in hose would make test inaccurate. Three-way valve is then flipped over to cut in main line from tank, and fill valve is opened to let fuel pump refill jar as below. To drive with rig on car, just shut fill valve. Note metal bracket that supports jar. Bent-over tabs hook it to mirror. Use synthetic-rubber windshield-wiper hose for gas lines. A hose that gas softens would clog pump and carburetor.**




PATH OF FUEL WHEN IDLING ENGINE TO REFILL JAR

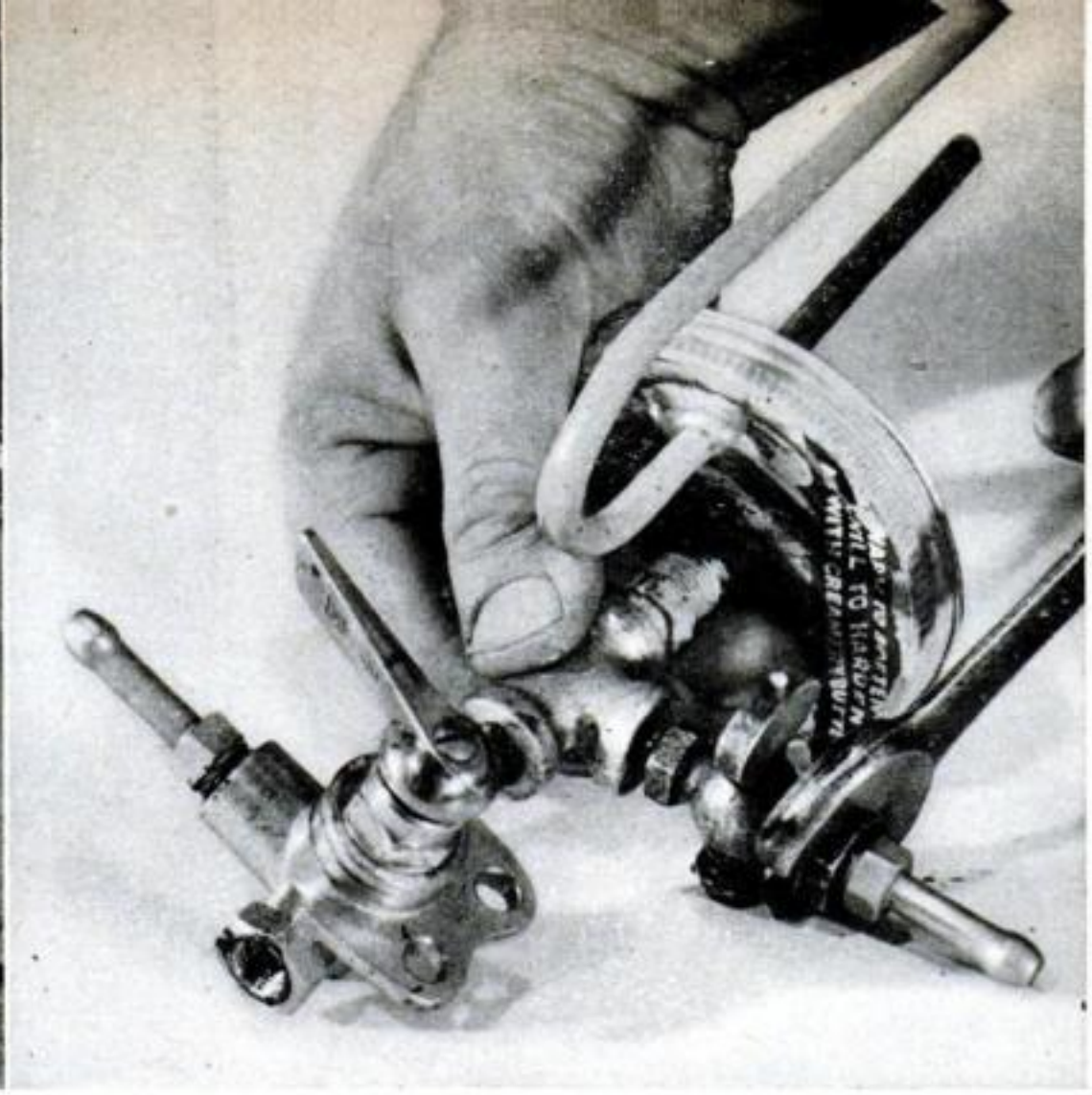




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**NOT A GAS THIEF** on the prowl—just the writer with gas-measuring outfit ready to install in a car of any make. Hose lengths are not critical since test is stopped the moment last fuel leaves jar.

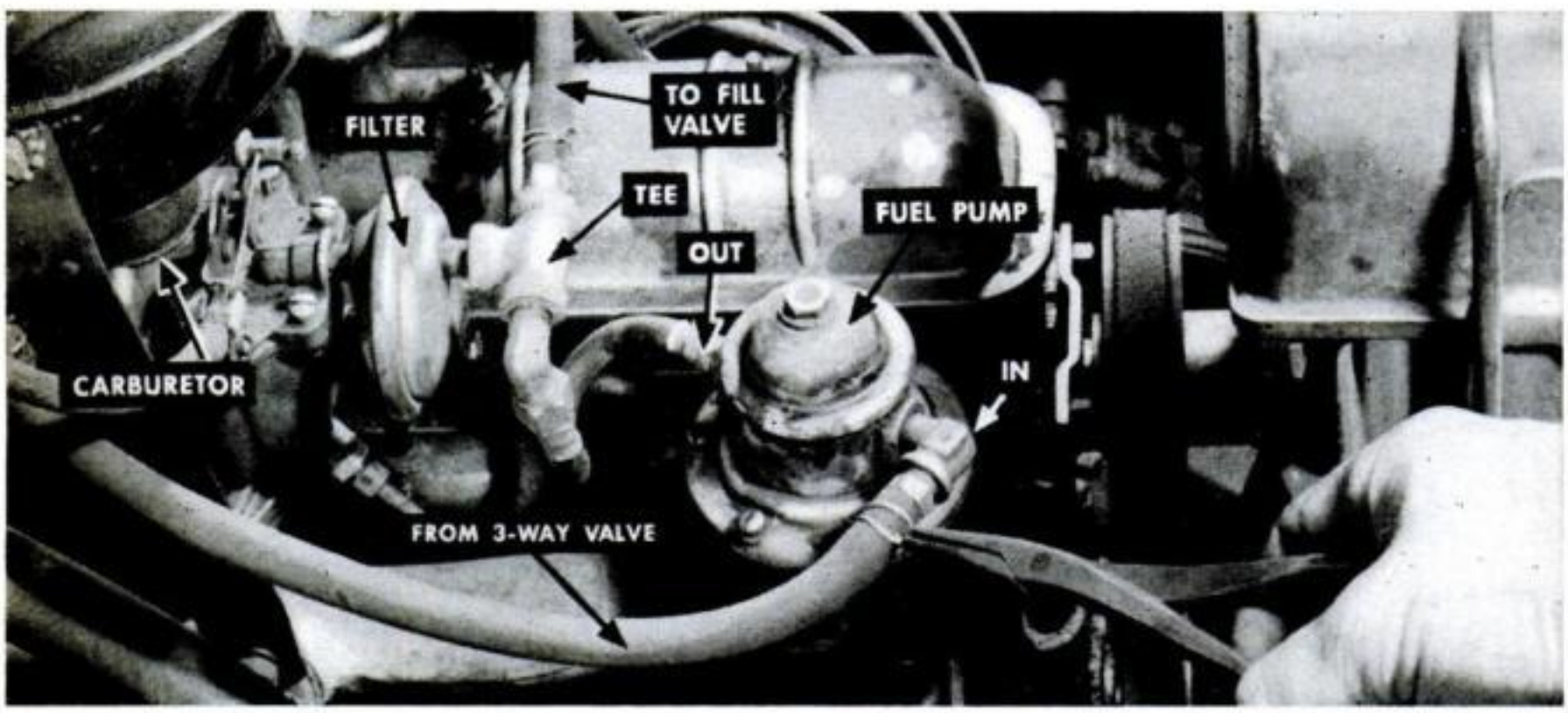


**A THREE-WAY VALVE,** straight valve, tee and nipple, all ⅛" pipe size, are assembled on the jar cover. If a three-way valve is not available, a tee and two straight valves can be assembled to do the same job. The vent tube should be trimmed so that it barely clears the bottom of the jar. The outfit cost the writer about $2.

is sloshing around in the jar. When I've run it dry, a tenth of a gallon has gone through the carburetor. The miles-per-gallon figure is the measured mileage multiplied by 10. Better yet, you can run 10 successive jars through the pot and take your mileage right from the speedometer.

Obviously, a narrow-necked burette with hairline calibrations, electrically controlled valves and a precision fifth wheel would be more accurate still. But if I can't stake my mileage figure against the Bureau of Standards, neither can anyone else without hundreds of dollars' worth of instruments.

***In making adjustments*** after a mileage check, I generally aim for economy *plus* performance. That's because a too-lean mixture causes burned valves and overheating. END




**SETUP ON CROSLEY ENGINE** is typical. With engine idling, fuel runs from tank to three-way valve, down to fuel pump, out pump and both into carburetor and past it to fill valve, opened to fill jar. When jar is full, fill valve is closed and three-way valve flipped over, cutting off tank. As car rolls, fuel flows from jar through fuel pump, into carburetor.



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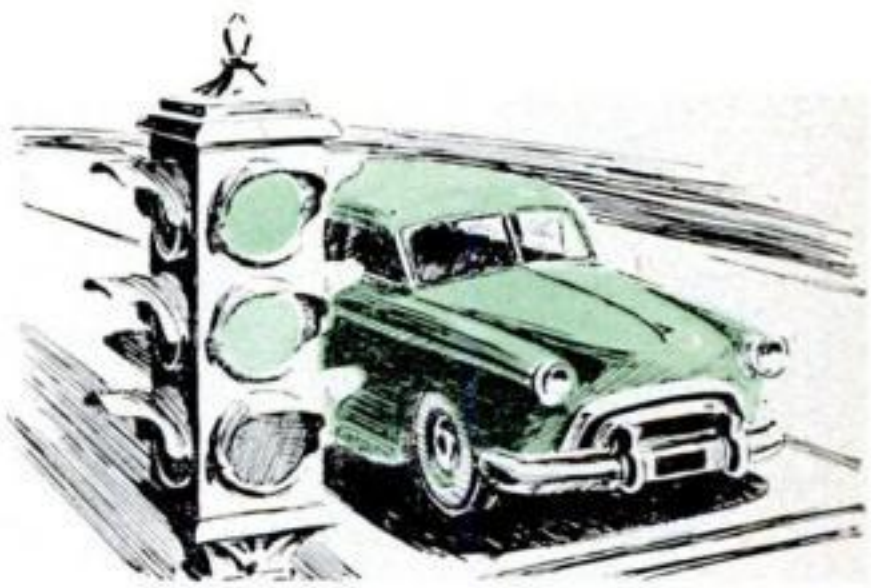
# The Road to MORE MILES Per GALLON



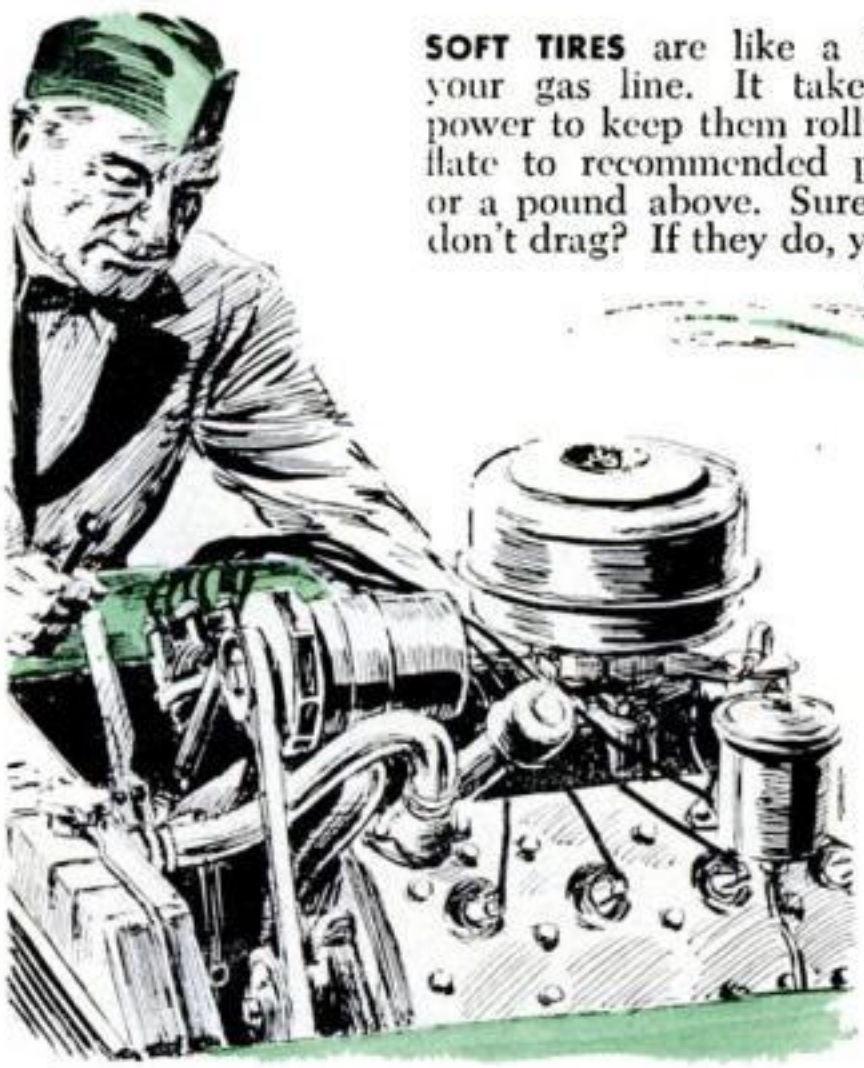
***The fellow with money to burn can find his match at the gas station. But if you want a hundred cents' worth of transportation for a buck, check yourself and your car against these proved mileage makers.***



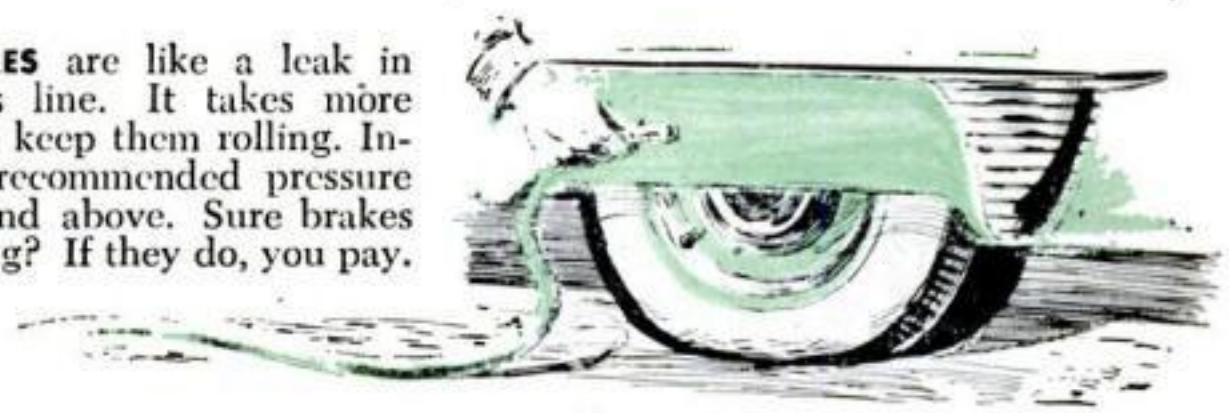
**GOOD GAS MILEAGE** starts in your driveway. Use manual choke as little as you can. If it's automatic, be sure it is working right. Shift to second as soon as you're rolling, and to high at the lowest speed the engine will manage. Cut the engine every time you park.



**PACE YOURSELF** to hit signals when they turn green, rather than dashing up to stop at red lights. It takes lots more gas to start from a dead stop than to roll through. Take it easy on the getaways; jack-rabbit starts are for the guy who enjoys buying gas.



**SOFT TIRES** are like a leak in your gas line. It takes more power to keep them rolling. Inflate to recommended pressure or a pound above. Sure brakes don't drag? If they do, you pay.



**TUNE UP** your engine for sweeter mileage. Keep carburetor on the lean side, idling speed as low as engine will tick. Set points to specifications, and have plugs cleaned and gapped regularly. Use the lightest oil that your engine's condition will permit.



**YOU PAY FOR SPEED,** not just for the distance traveled. It takes more than twice as much gas to go a mile at 65 than it does at 35 m.p.h. Modern highways make this a tough choice. A good compromise is 50, but don't "pump" the throttle. Flashy passing burns gas fast.



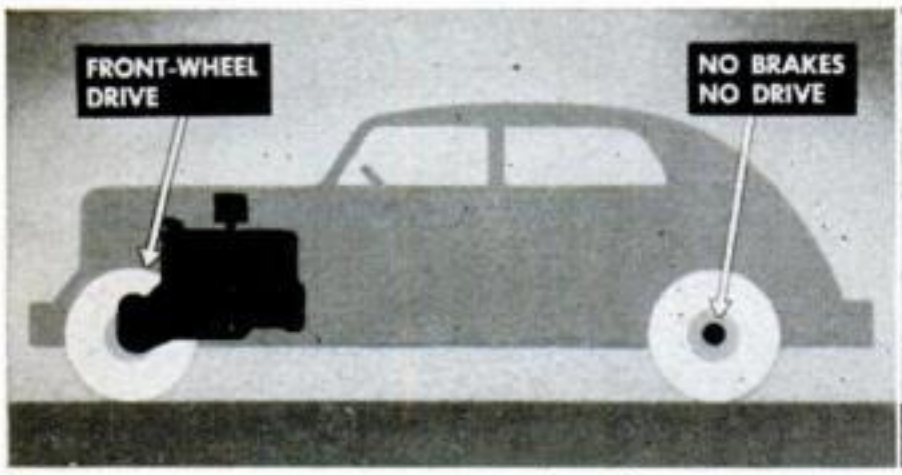
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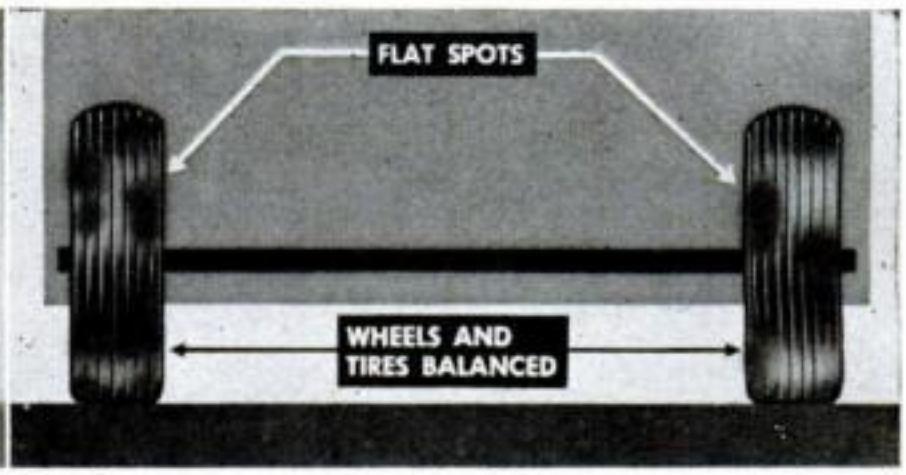
# How to Read Your Tires

***You can save a lot of that green folding stuff by learning what each wear pattern means—and then correcting the trouble.***

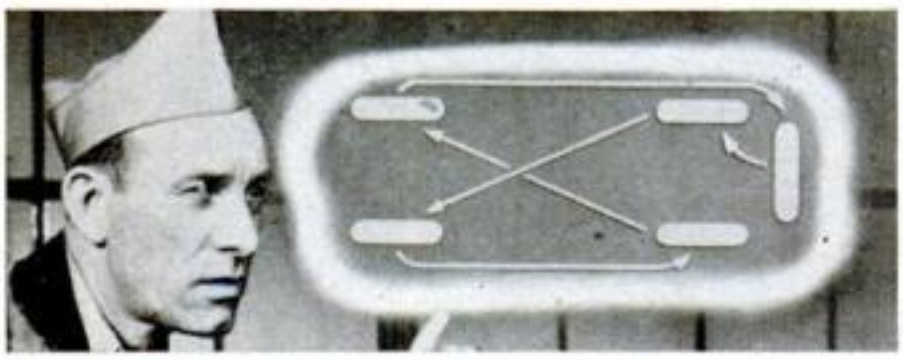


**Flat-spotting,** or cupping, is easily recognized. It may show up on new tires before they have traveled more than 2,000 miles. Since this wear appears only on front tires, mechanics sometimes try to stop it by aligning the front end or balancing the wheels. But an investigation of flat-spotting by Chrysler indicates that alignment or balancing isn't the cure.



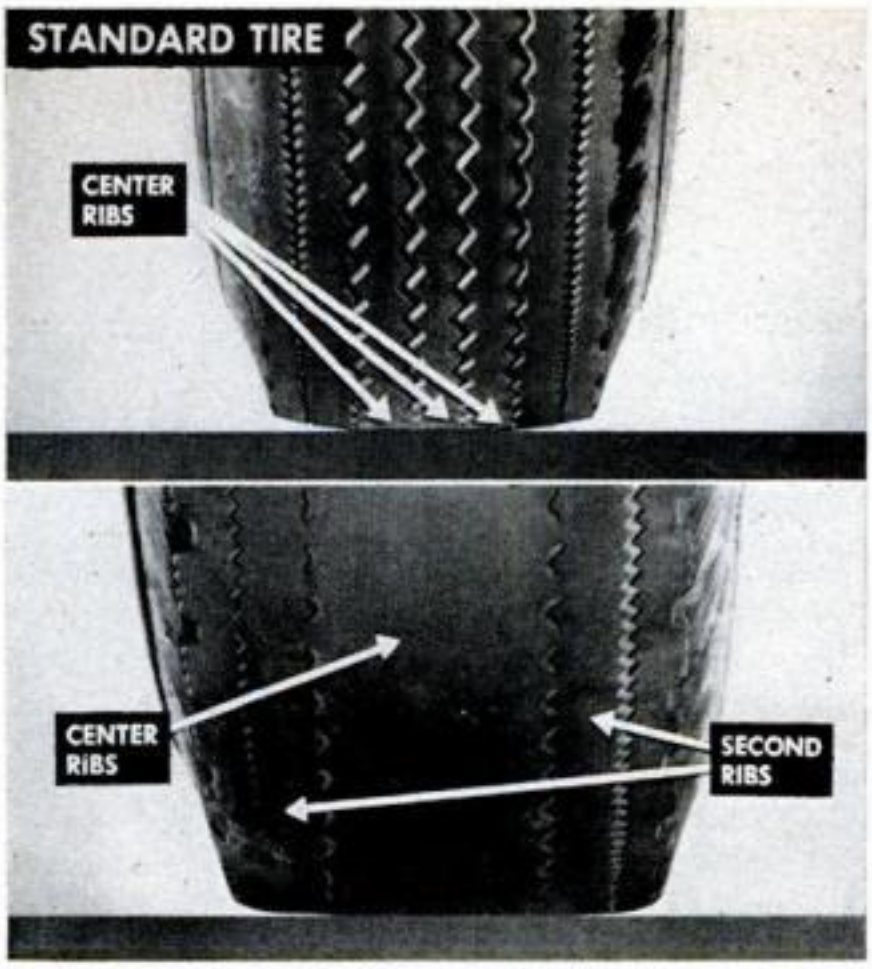

**To study flat-spotting,** Chrysler engineers rigged up a special test car with a front drive. The rear wheels and tires were carefully aligned, balanced and mounted to run free on a rigid axle. Then the car was driven back and forth on a 25-mile stretch of straight, level and smooth highway. At each end of the test course, the car was jacked up and turned around so there would be no wear from steering drag. Nevertheless, flat spots developed on the free-running rear tires. The driving front tires showed no sign of spots. Normally they develop only on front tires.



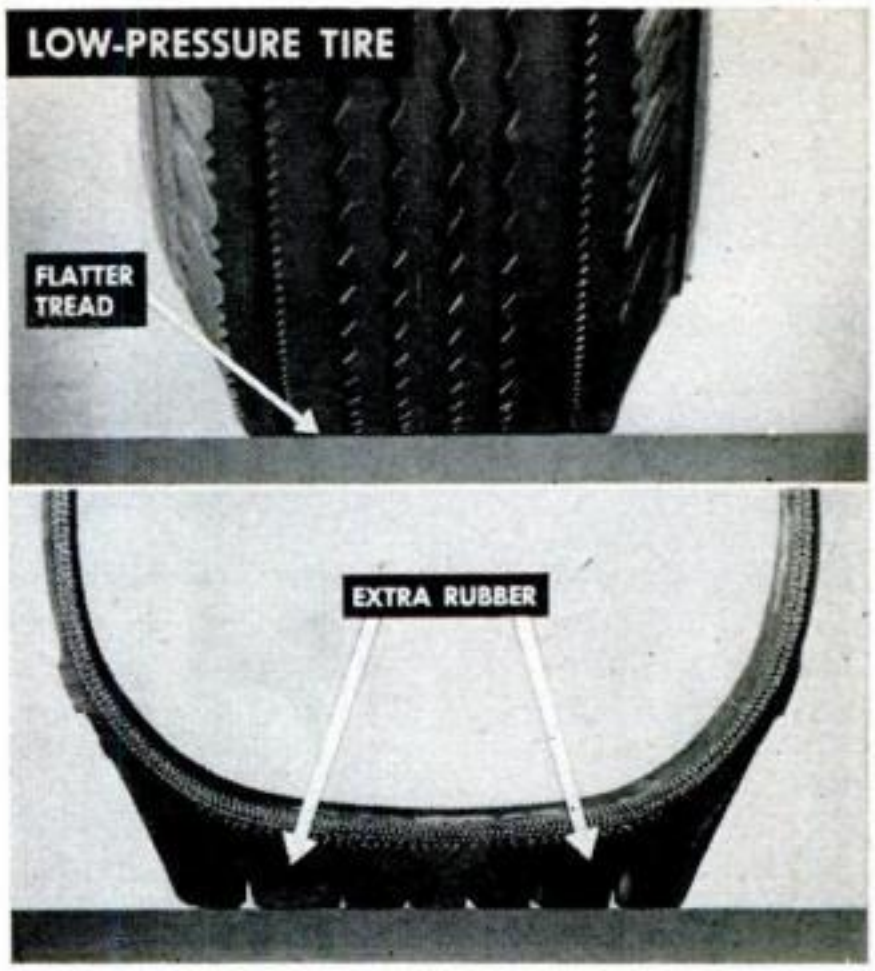
**To correct cupping,** the investigators concluded that crisscrossing tires every 2,500 miles was the only thing to do—and that's what they are advising mechanics in the film from which these pictures were taken. When cupped tires are shifted to the driving wheels at the rear, the wear soon evens out. What actually causes cupping? No one knows for sure.



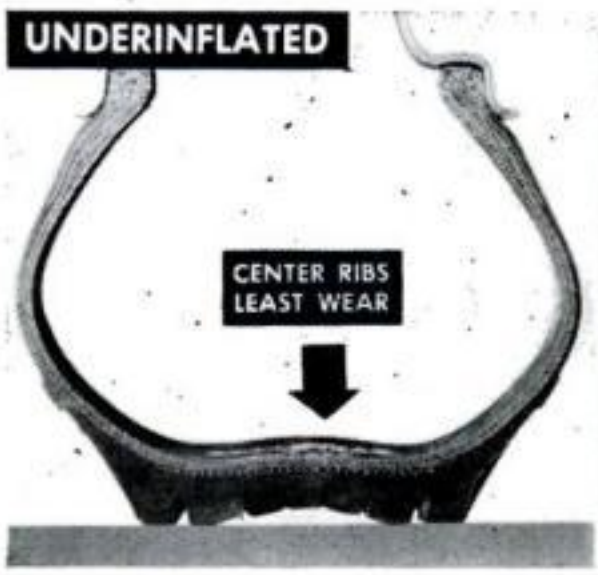
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**Even wear** of the center and "second" ribs of a standard (non-low-pressure) tire shows you are getting full value from it. When inflated properly, this type of tire should ride on the center ribs, as the top photo shows, and these should be the first to show wear.

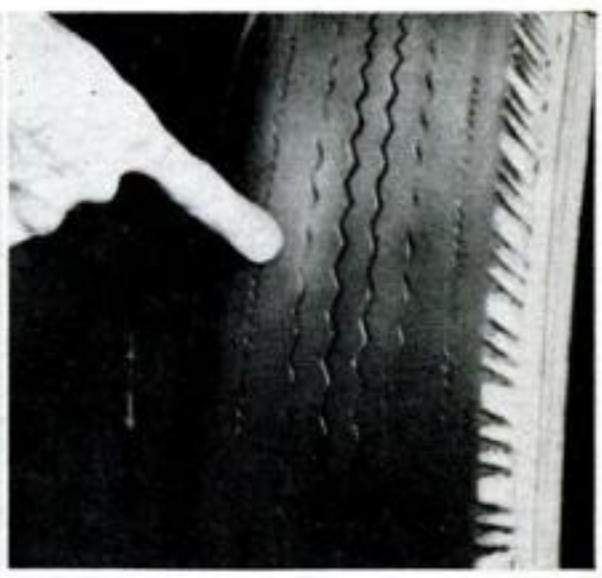



**A low-pressure tire** is designed with a flat tread so that the full width contacts the road surface when the tire has the correct amount of air. Extra rubber backs up the second ribs. Equal wear across the entire tread shows your tires will last their full life.

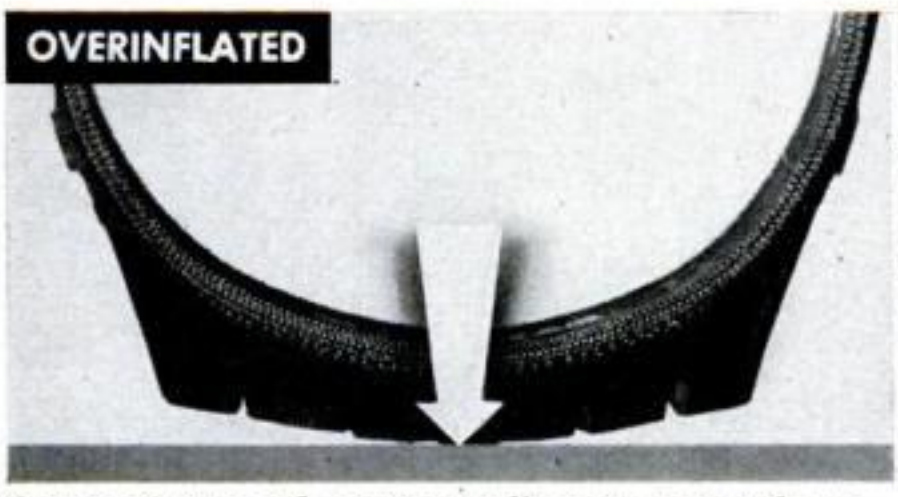








**Underinflation** causes the center ribs of a low-pressure tire to curve up away from the road surface as you see in the section above. Consequently, the center ribs wear little or not at all. At the beginning, the second ribs will wear off at an angle as seen in the second photo, and there will be little sign of wear on the edge ribs. But finally, if underinflation continues, both the edge and second ribs will show heavy wear. Heavy wear on the second ribs of a standard tire also is a sign of underinflation. Even a couple of pounds under the recommended pressure may do it.



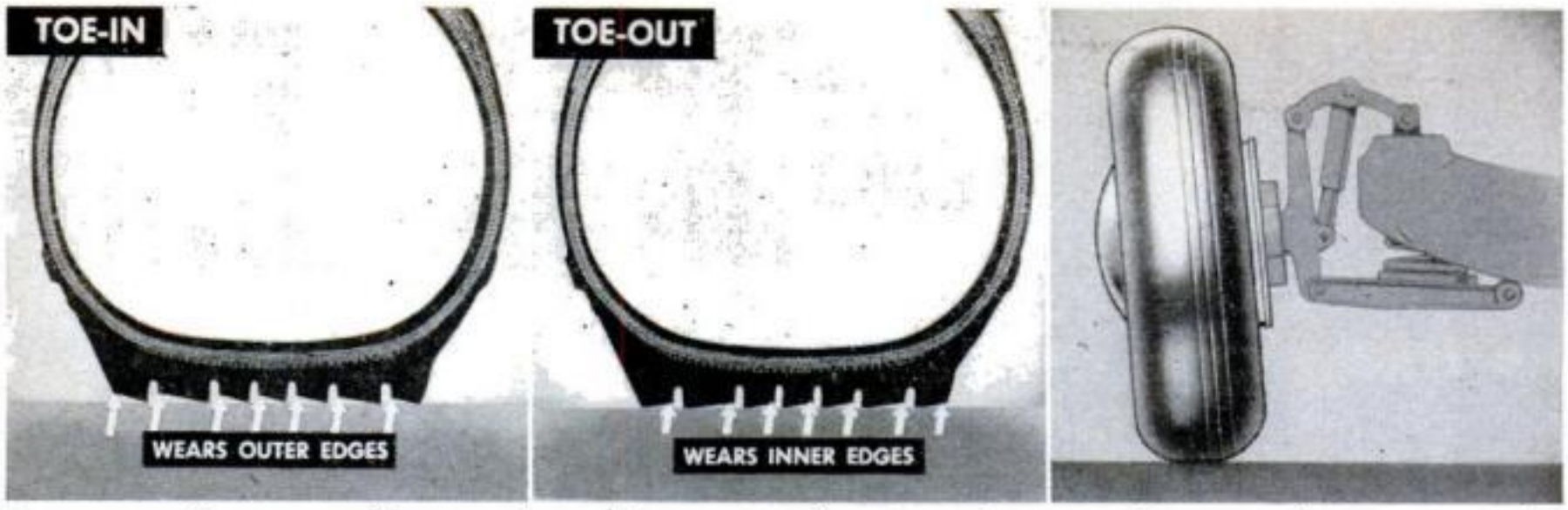



**Overinflation** of any tire will cause it to ride on the center bead. A strip of heavy wear down the center of the tire, therefore, indicates you should go lighter with the air hose. Tire in second photo has plenty of good rubber along edges, but fabric shows in middle.

***Please turn the page for more on tires.***



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**Incorrect alignment** of front end soon shows up on front tires. Too much toe-in causes tires to be pushed along in pigeon-toed fashion. Outside edges of tread ribs are scraped along road and wear more than inside edges. Too much toe-out causes same kind of wear but on the inner edges. Toe-in and toe-out wear can usually be felt before it can be seen. Run your fingers across the tire and you can feel a feather edge scraped out from edge of the tread that isn't wearing. Heavy wear around the outside edge of tire (at right above) shows excessive positive camber. Wear on the inside indicates negative camber, a fault you should have corrected in a hurry.

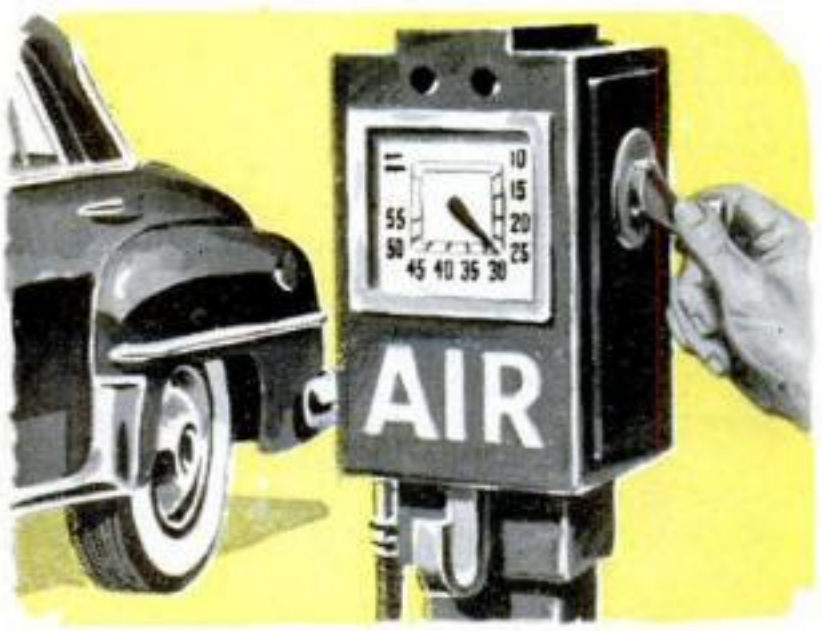
# Tips on Tires



**Air may be trapped** between tube and tire when a tire is mounted. When this air escapes, tire becomes underinflated. So check pressure every day or so for a while. Pressure should also be checked frequently in new tires because they become a bit larger at first. Because of the greater volume, the pressure drops.

**Bleeding a hot tire** only increases the chances of trouble. Because of the lower pressure, the tire will flex more—and get hotter.






**Tires need right amount of air** for same reason engine needs right amount of oil—to reduce friction and prevent dangerous heat. Too little air will burn out your tires by causing sidewalls to flex and overheat. This may cause tread or ply to separate, cords to snap. Such flexing can make a tire even hotter than its vulcanizing temperature.

**Two pounds' extra pressure** is a good rule when you are starting a long trip with a load heavier than usual.

**Tires wear differently** on each wheel. That's the big reason for a regular rotation program.



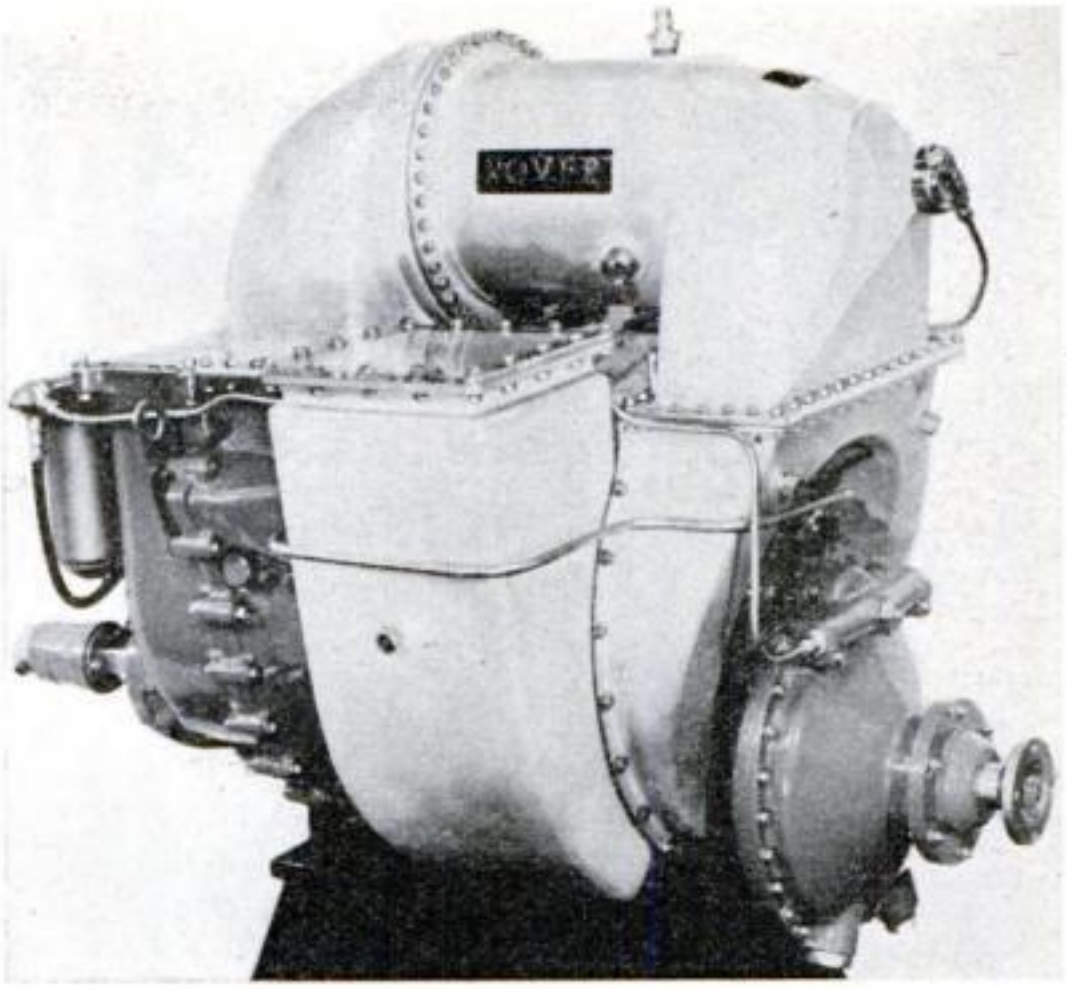

**Cool weather** is best time to break in new tires. Like shoes, tires flex, stretch and relax when first put on. Tests have shown a tire broken in at moderate speeds during cold weather will take its final shape slowly without stress, strain or overheating.



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# New for Cars

## A Turbine to Power Your Car?



You never would recognize this as an automobile engine. But that's what it is—the latest version of an experimental turbine developed by Rover Company, Ltd., of Birmingham, England. It will be used for continuing road tests in a special car built for the purpose (PSM, June '50, p. 98). In the latest tests, in Belgium this summer, the turbo-car hit more than 152 m.p.h.

Since the car was first demonstrated, a heat exchanger has been added to the engine to reduce fuel consumption, originally much too heavy for a practical car. The exchanger does the job, but Rover officials say it is not yet fully reliable. The engine can run on a variety of fuels, including kerosene. It develops 200 horsepower.

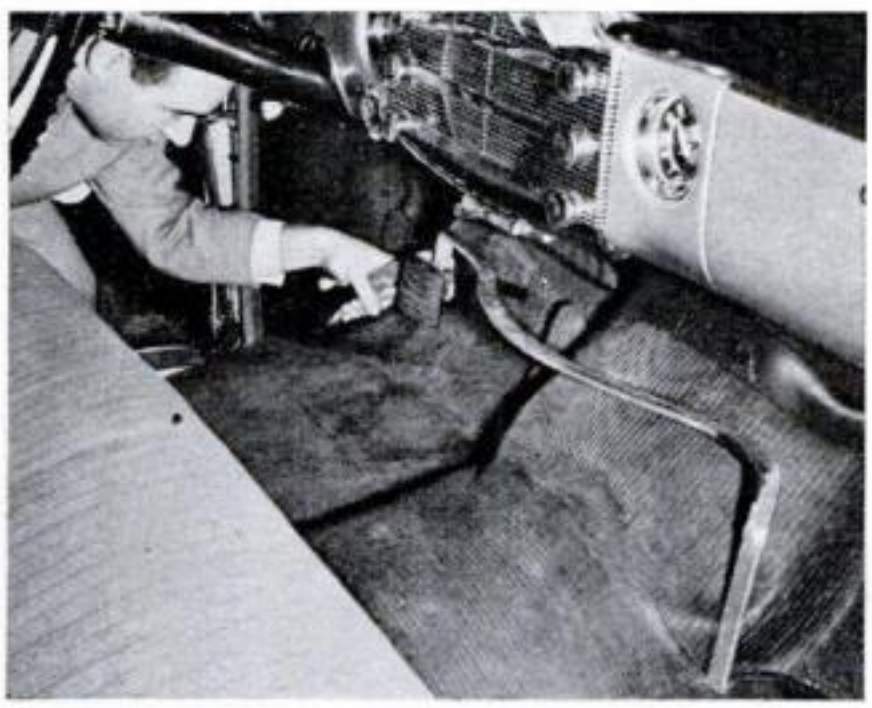
Experts expect the engine to be used first in sports cars since its power is so high in comparison with the weight. The turbine also gives very smooth and rapid acceleration. The car uses no clutch, transmission, carburetor or ignition system.

## Brake Lining Clamps on Shoe

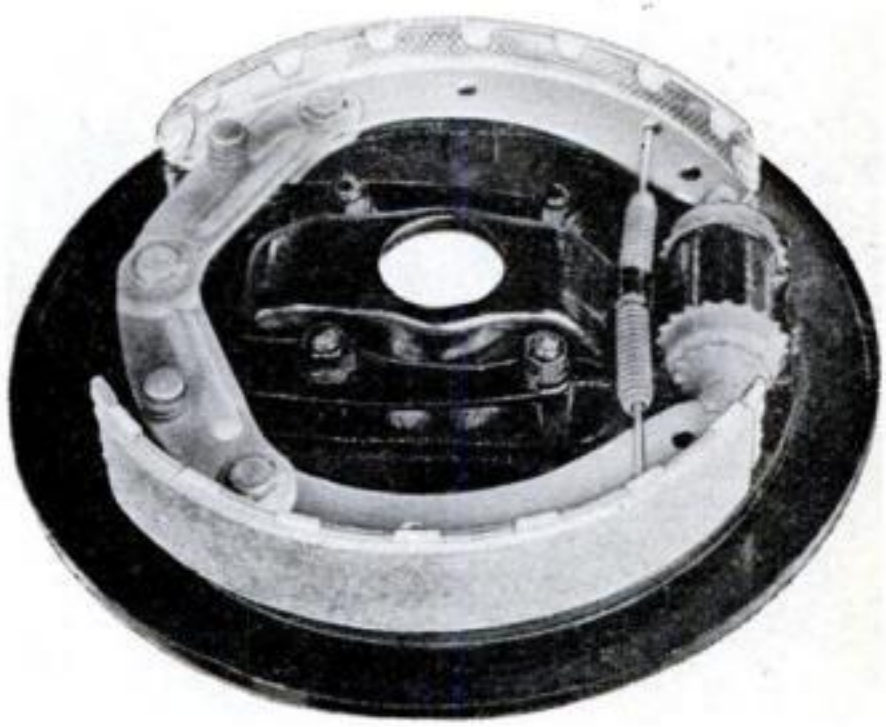


BONDED at the factory to metal backing plates, these replacement brake linings can be quickly installed with a hammer or a special crimping tool. Metal tabs on the Lock-On unit are bent firmly around the brake shoe after the old lining has been removed. *Lock-On Brake Lining Corp., 620 N. Almont Dr., Los Angeles 46.*

## Brake Control Aids Beginner



WHEN you teach someone to drive, this brake control will enable you to stop or slow the car if the novice gets rattled. A metal bar, it clamps to the pedal at one end, rests on the car floor at the other. *Seyber Mfg. Co., P. O. Box 557, Lynbrook, N. Y.*





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# Gus Pulls a Trick Play

***To Jefferson High, marooned in the Model Garage with a busted bus, that opening game meant more than the Rose Bowl . . . It was no time for Gus to fumble the ball.***

**By Martin Bunn**

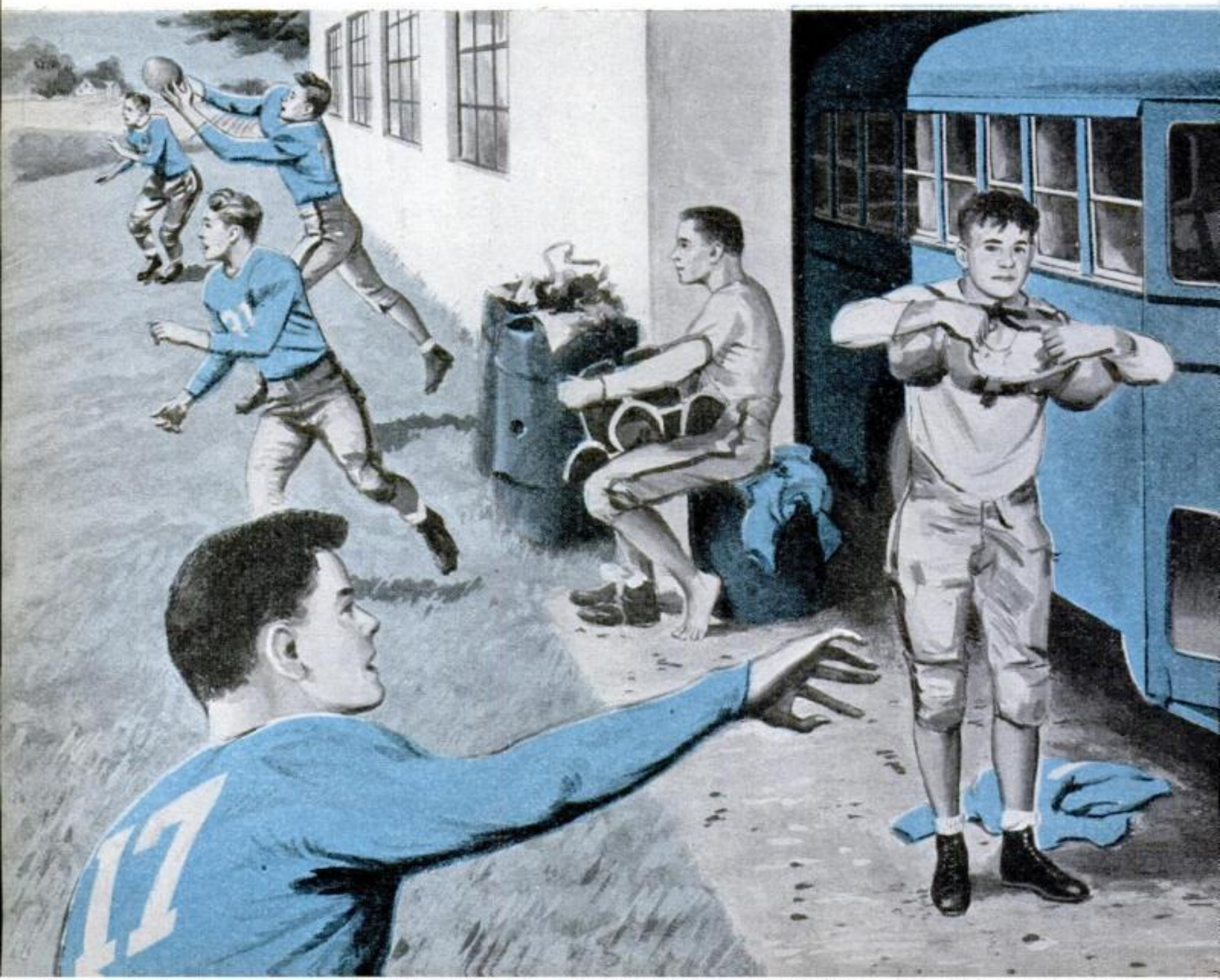
IT WAS not a morning for working, not that morning on the bright, crisp edge of September. Perhaps it was the pungent trace of wood smoke and burning leaves spicing the air. Gus Wilson breathed deep as he lowered the lube rack. Whatever that intangible ingredient was, it had no effect on the Model Garage. Saturday morning was rushed as ever.

Gus backed the old Essex off the rack and rolled it out to the side of the garage to make room. It was then that he noticed a big school bus being pushed past his gas pumps by a bunch of husky teen-age boys.

"That's far enough, fellows." An older man, who seemed to be in charge, wiped his forehead with a hand that left a greasy smear, and grimaced at Gus.

"I'd be glad to let you have this heap for a thin two-bits!"

"I'll take it," Gus grinned. "But what seems to be the trouble?"



"Trouble isn't the word for it! It's ten now, and in three hours Jefferson High is supposed to play the first football game of the year. I'm the coach. We're scheduled to meet Greeley Prep at Millrace Corners, and that's 50 miles from here. Now I get halfway there and this bus starts acting up again!"

"Again?" asked Gus.

"Yes, it's the fourth time she's gone dead, and don't tell me I need a new fuel pump! Joe Barnes, the regular driver who ferries the kids during the week, says it's happened three times during the last week and they put in three new fuel pumps and one carburetor. Now it's done it again!"



"Well, what seems to be wrong with it?"

"Only one thing is definite. Fuel isn't reaching the carburetor. Yeah, I know! It sounds like the fuel pump!"

Gus shrugged his shoulders and opened up the hood. "You're right. It does."

Gus was aware of the tense, impatient interchange of worried glances among the little group of football players who crowded around him as he checked the carburetor. He worked slowly and surely, thinking about the boys, and how disappointed they'd be if their opening game had to be canceled.

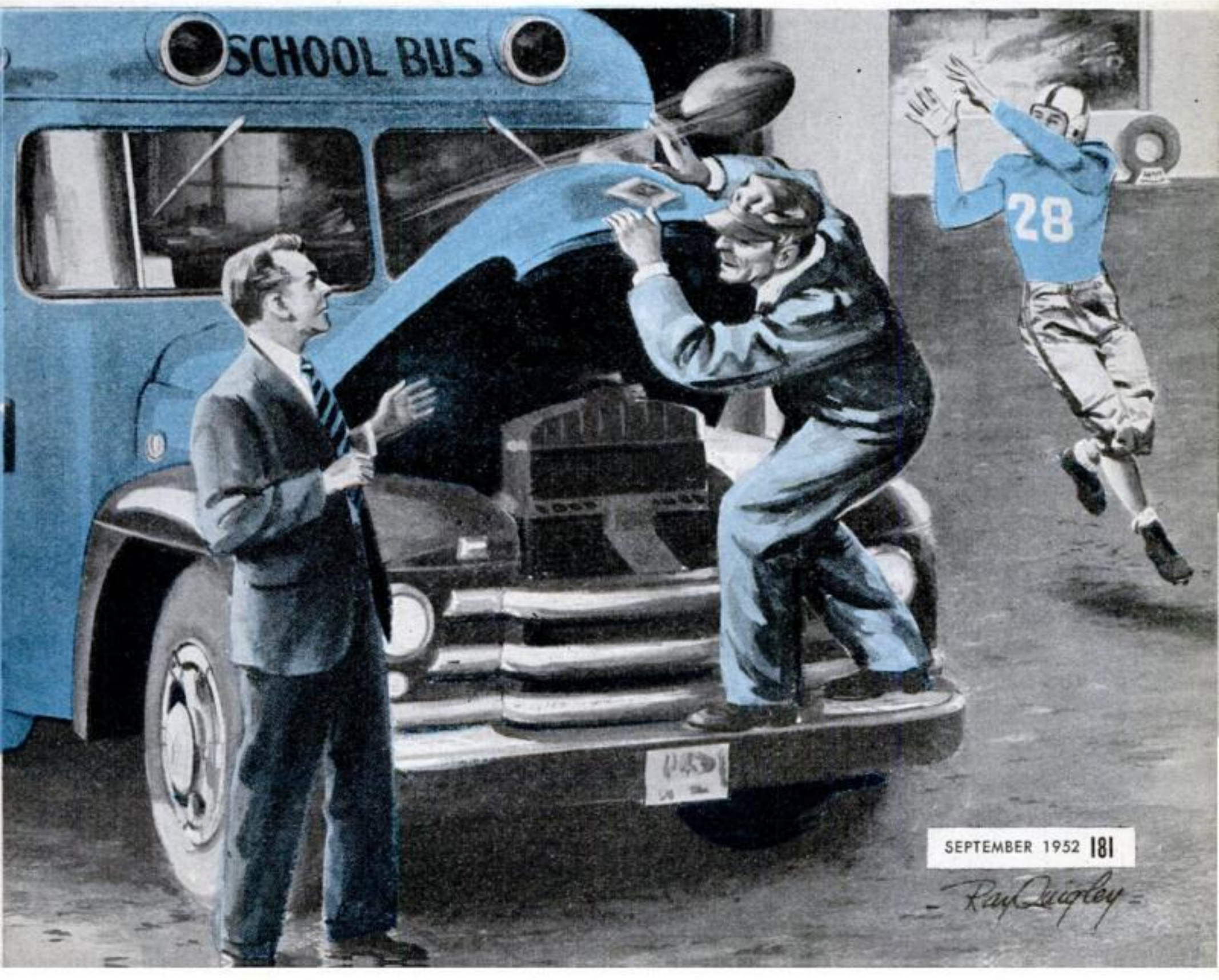
"You guys are mighty anxious to get to that game, aren't you? What positions do you play?"

The boy at Gus's left shoulder, a wiry keen-looking youngster, spoke up.

"Well, I'm Tom Kendall, sir. Fullback. And this is Willy Horton, halfback, Herby Ashton, center, and old B-B—I mean Bud Black. He makes the extra points with his educated toe."

"A lot of good that toe'll be if we don't even get there," the coach groaned. "I can see it now. Paul Thompson. Stenciled on a cot at the poorhouse!" He said it facetiously,

*Gus raised his head and almost got conked by a football.*



but Gus detected a serious note beneath the attempt at humor.

"Why do you say that?"

"Jefferson takes football seriously. There's a great deal of school pride involved. And we won one game last year! The school board, the alumni, all of them are after my hide. If I don't pull something out of the bag this year, well . . ." He let it go at that.

### *Players Don Uniforms to Save Time*

Gus finished with the carburetor. There was nothing wrong with it. As the coach had said, gasoline wasn't getting that far.

He pulled a wrench out of his dungarees and disconnected the line from the carburetor to the fuel pump. But it, too, was perfectly okay.

"Let's try the rear section of fuel line leading from the tank."

"Can't you hurry? It's 10:15 already!"

"If I go any faster, I might overlook something. Just take it easy."

"Easy! It'll take an hour and a half in this traffic to get there. Fifteen minutes for the boys to change and ten minutes to talk 'em into the right mood!"

"Why not let them change right now in the garage while they're waiting?" Gus suggested.

"Swell idea!" Coach Thompson looked more cheerful as he rounded up his players and shooed them inside. "Hop to it, men!"

While the team tramped noisily into the Model Garage, Gus finished dismantling the fuel line running from tank to pump and tested it for obstructions and leaks. There were none.

The outlet on the gas tank, where the fuel line connected, was not blocked. And the tank was almost half full.

He reconnected the line and scratched his head. Then he remembered.

"Forgot about your filter. Sometimes they get overloaded with silt."

"If it was that, why would it run perfectly for a couple of days at a clip after those other mechanics put new pumps in?"

"Well, might as well check it anyway. Never can tell."

### *Dizzy Definitions*

**Main Springs**—Source of water for your radiator.

**Gearbox**—Handy place for your fishing tackle.

**Brake Arm**—Happened pretty often in the old days when they had to start 'em with a crank.

**Muffler**—Indispensable for back-seat drivers.

**Tie Rods**—Swell to hang your ties on and avoid wrinkles when traveling.

**Radiator Grille**—Good gadget for cooking your own hamburgers on a trip.

**Crankcase**—Imagine the guy suing you for putting one little dent in his fender!

He removed the small bowl with its fine-mesh copper screen and found a minimum of silt in the bottom. That was that . . . and he was right back where he started. It was such a simple thing, there being nothing complicated between gas tank and carburetor. The pump was the only item he hadn't checked, and the reason he hadn't torn it apart was that it was brand-new. The third new pump installed in a week, and he had been sure there was an outside cause, something else rather than pump failure. If not, then Thompson had been handed a mighty unlikely coincidence.

That situation and the previous bunglings of other mechanics left him confronted with a delicate problem. . . .

In twos and threes the football players were trotting out now, looking bigger and more impressive in their uniforms, yelling cheerful insults to each other. They seemed to take it for granted that Gus would spot the trouble and get them started in time. Their confidence made Gus all the more anxious to see that they had their chance to play this opening game that meant so much to them. . . . And then there was Coach Thompson—he seemed like a pretty good egg after all, and his future might depend on whether his team played—and won—today. Gus held a lot of responsibility in his two grease-stained hands. He went back to work.

### *Flying Football Just Misses Gus*

When he stuck his head out from under the hood a couple of minutes later, Gus almost got conked by a flying football—two of the players were demonstrating their passing prowess—but he didn't care. He felt he was getting close to a solution to the mystery—at least he knew what *wasn't* wrong.

"Mr. Thompson, as you said, you aren't getting gas to the carburetor, and yet your fuel lines are clear. You know what that leaves?"

Paul Thompson's face darkened. "The fuel pump! You're going to suggest a new one?"

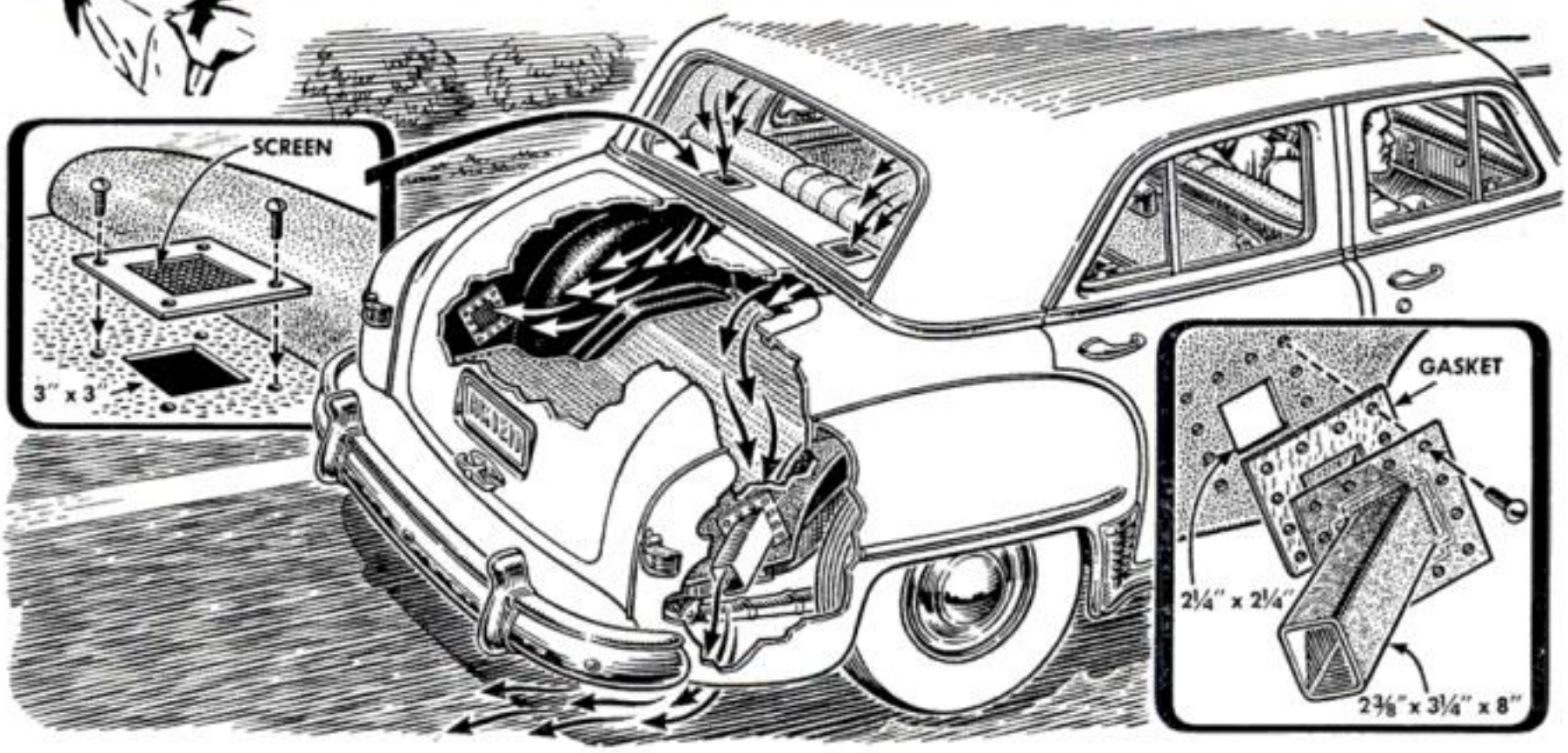
"I'm only telling you I've checked everything else that could keep fuel from reach-

[Continued on page 230]



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# Hints from the Model Garage




**Rear air outlets** installed like this will often increase the effectiveness of a heating system that draws fresh air from outside, especially if the car is tightly sealed. The circulating air also will help keep the side and back windows free from fog, keep the trunk free from dampness and make it unnecessary to open windows.

Screens over the parcel-shelf openings prevent objects from falling through. The outlet can be a piece of square gutter pipe. Point it back to keep out mud and water.




**For work under a car,** a gooseneck desk lamp is an excellent addition to a creeper. Drill the base of the lamp and screw it to the creeper. Invert the shade to throw light up. The flexible neck will keep the light in the desired position.



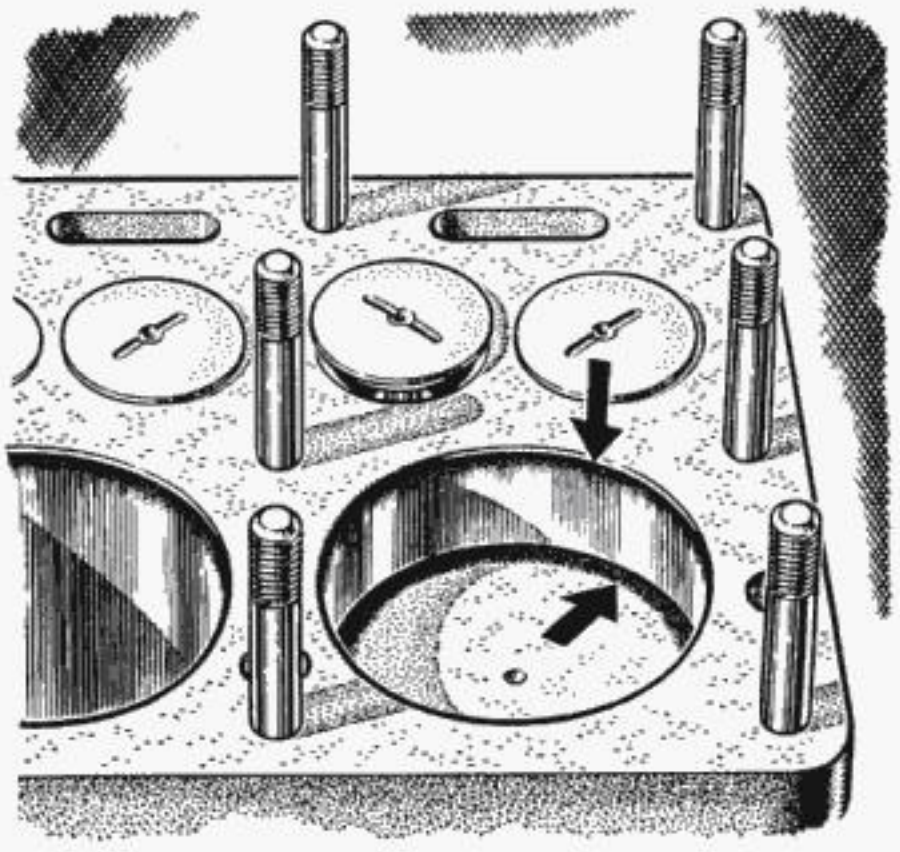
**If a mirror rattles** in its frame, transparent windshield-glass sealer or a clear cement applied between the glass and rolled edge will keep it quiet. Remove mirror and place it flat to do the job. Scrape off excess cement with a razor blade.

***Please turn the page for more auto hints.***

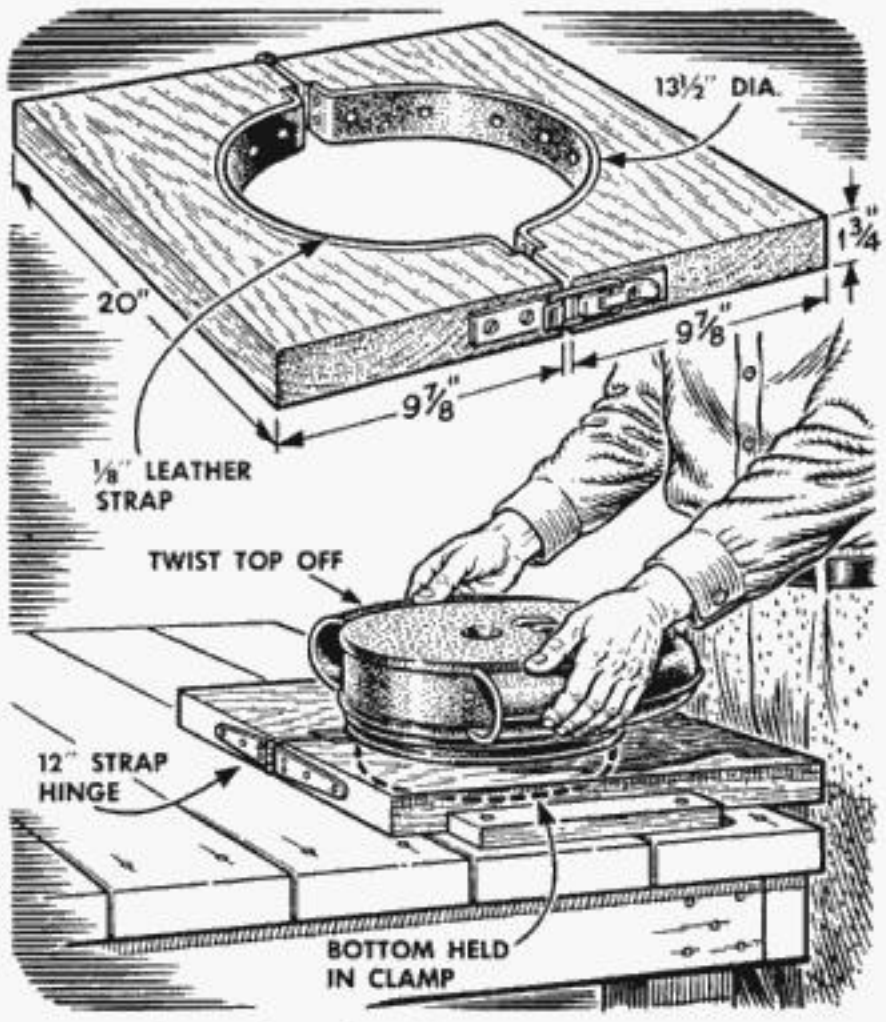


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## MORE Hints from the Model Garage



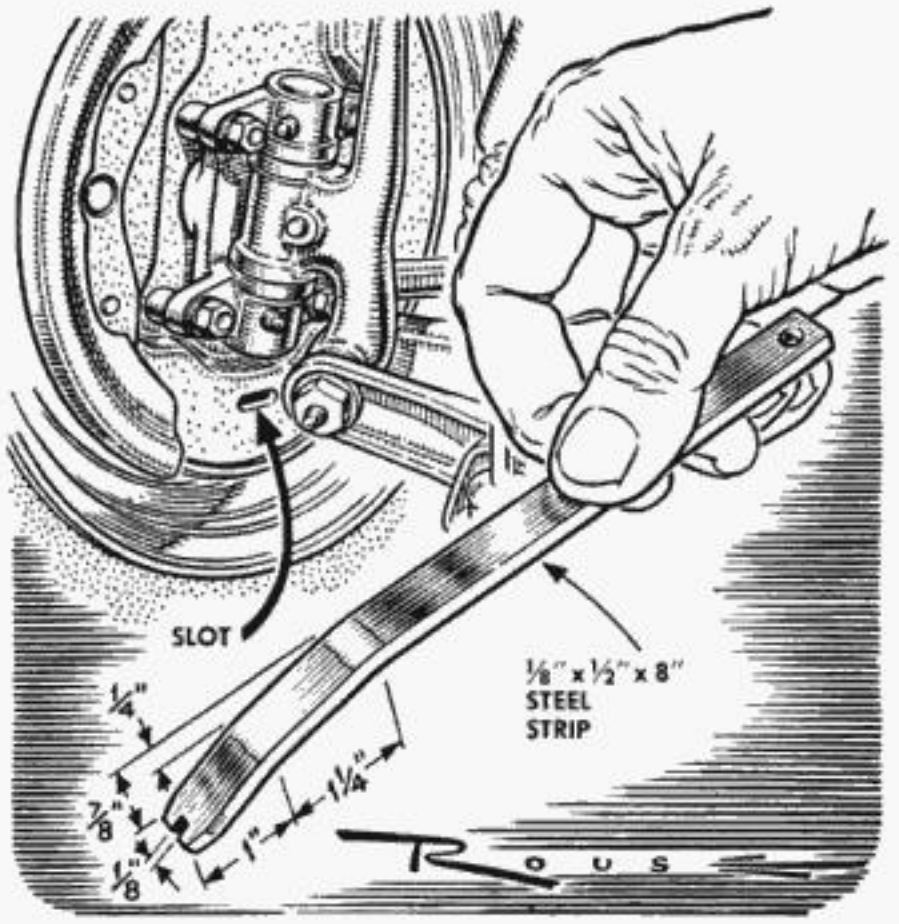
**In scraping carbon** from an engine during a top overhaul, some mechanics contend you can do too good a job. Their practice is to leave a ring about ⅛″ wide around the top edge of the piston and another ring around the bore just above piston travel. This, they say, will preserve the oil seal. Removing the carbon may make the car an oil hog.



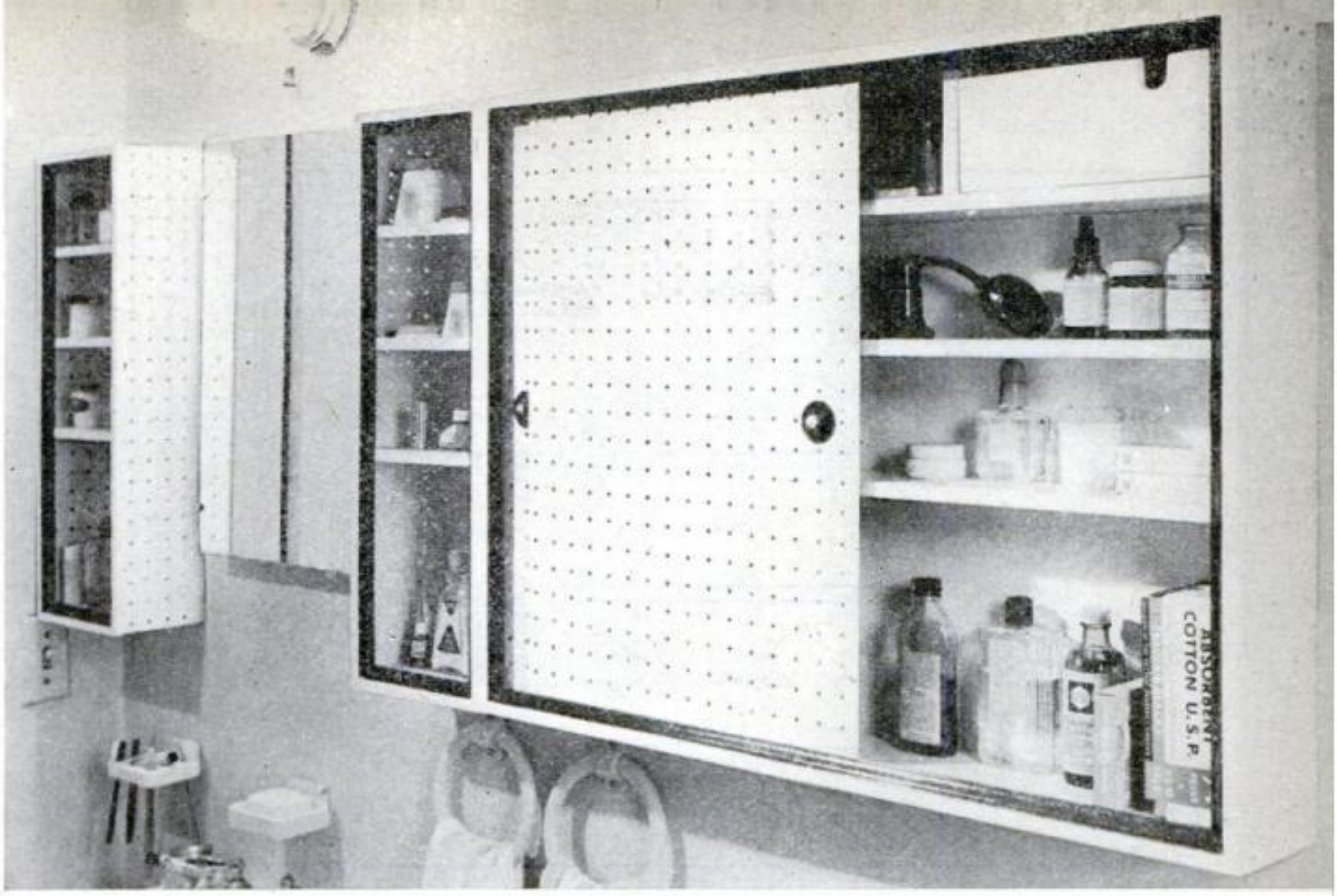

**Removing the air-cleaner cover** on a new Cadillac can be troublesome. Driving it off from underneath may deform the metal. This clamping device will do the job with ease. Remove the cleaner from the engine, clamp the bottom between the leather-lined jaws, and you can twist off the top without causing any damage to the metal.




**Cold drafts** can be kept out of a garage fitted with overhead doors by slitting a length of garden hose and nailing it to the bottom edge of the door. This will seal the opening even if the floor of the garage is uneven.




**A wrench** for adjusting brake shoes can be made from a piece of ⅛″ by ½″ by 8″ mild steel. File a ⅛″ slot in the end and bend to the shape shown above. Use by inserting it in the slot on the backing plate and prying around the notched wheel.




# These Cabinets Clean Up Bathroom Clutter

By C. Strickland

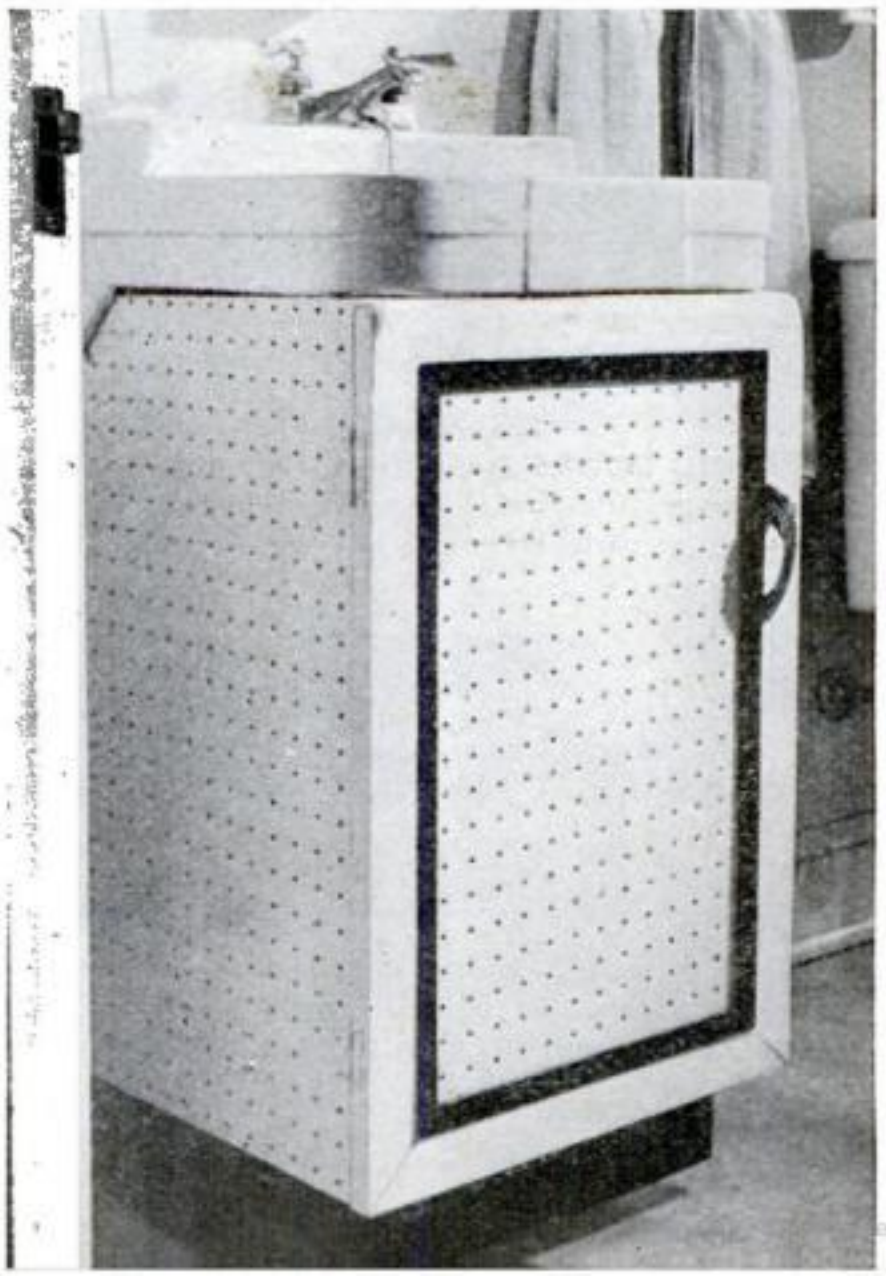
***Shelves are spaced for both short and tall bottles in wall cabinets that fit existing but unused space.***

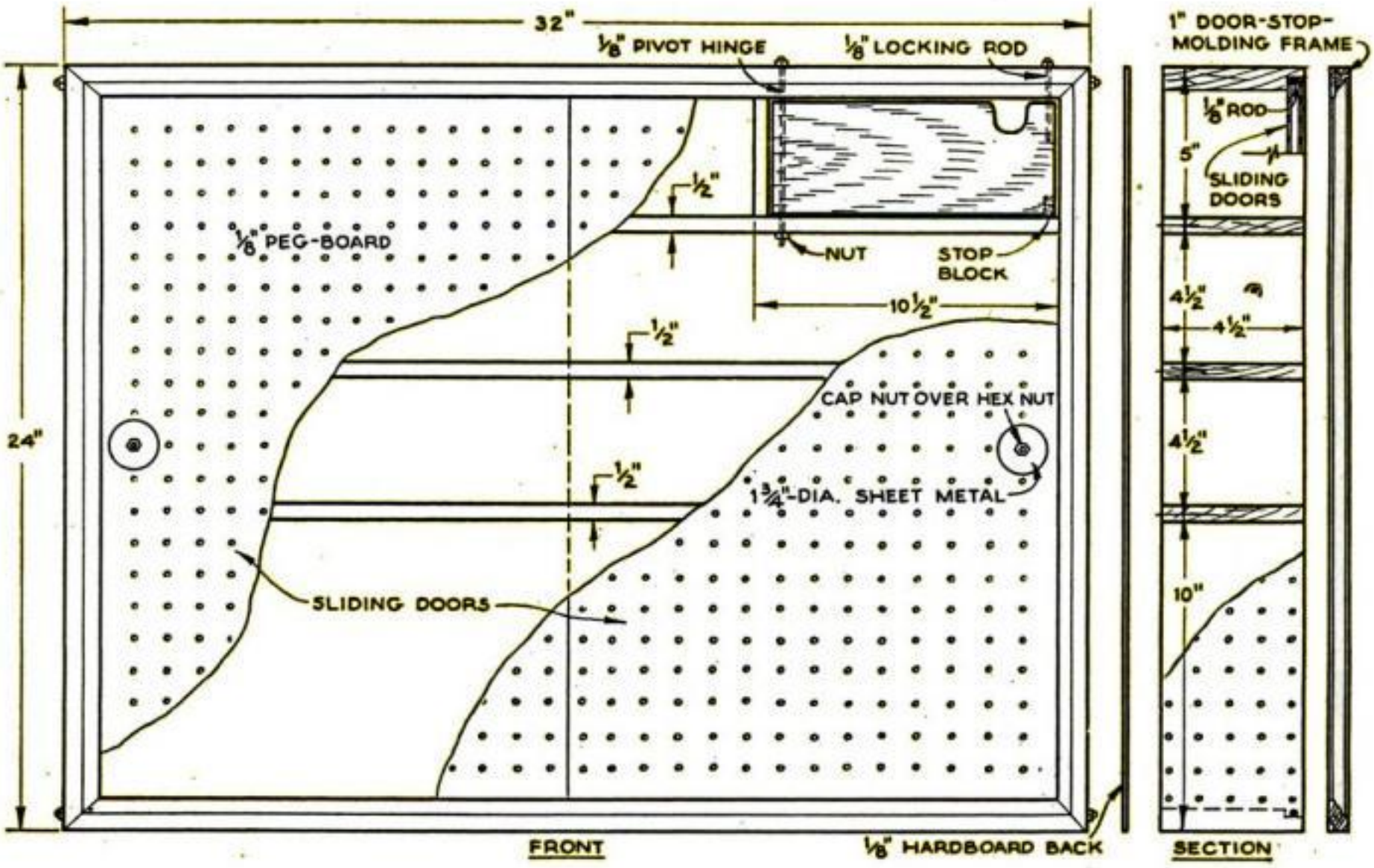
"AMPLE storage space" is what the real-estate salesmen always claim for their new homes. Usually the houses live up to the claim—with one big exception. That's the bathroom.

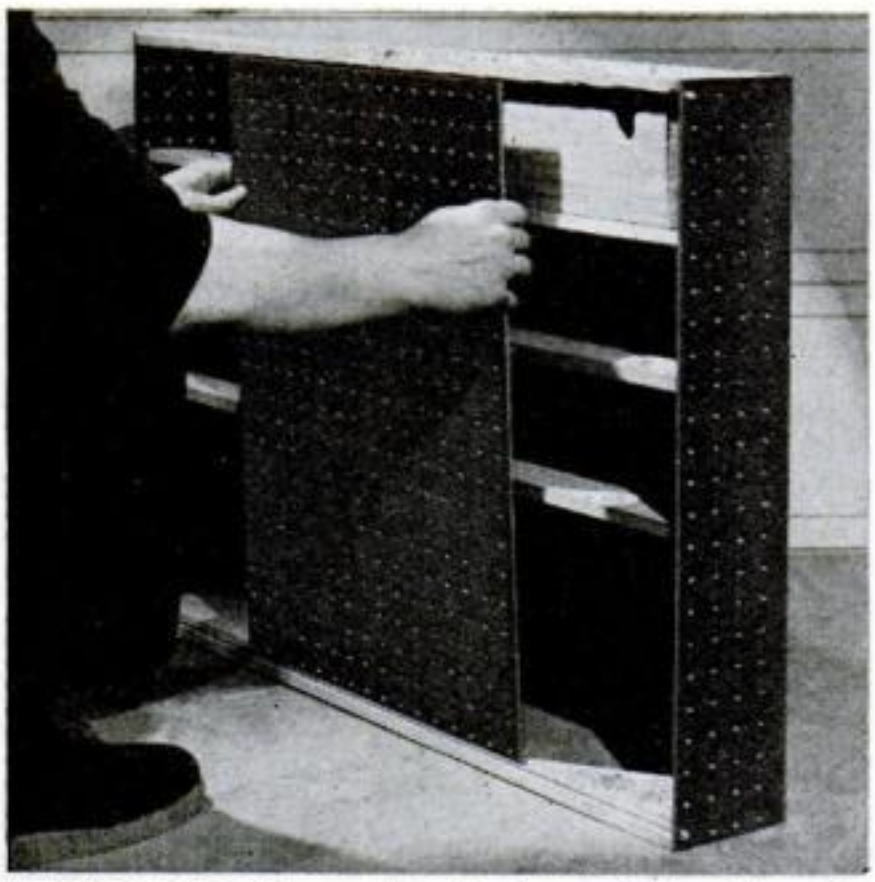
Take our bathroom for instance. It is 5′ by 8′ and had only the usual small medicine cabinet—one of those shallow chests that always look crowded even though you've only got a razor and a bottle of aspirin inside. As for storage space for cleaning equipment—brushes, cloths, cleanser—there just wasn't any.

These two wall units and the under-basin cabinet are my answer to the lack of bathroom storage. They utilize space that is otherwise wasted and they are easy to build. In fact, I had a lot more trouble photographing the cabinets in our little bathroom than I did building them.

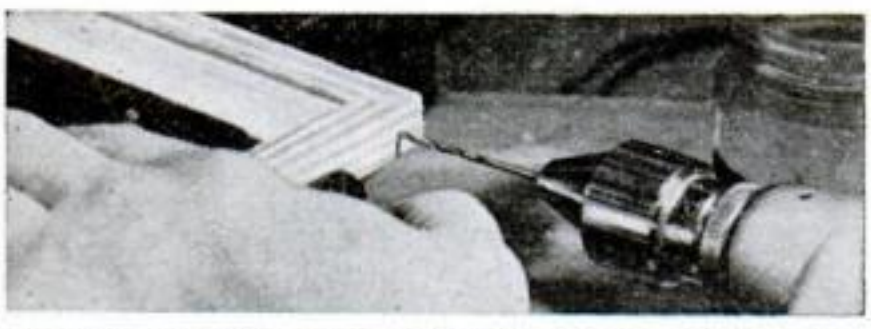
***Wall units.*** I bought all the lumber for these for about $3 and had the rabbet for





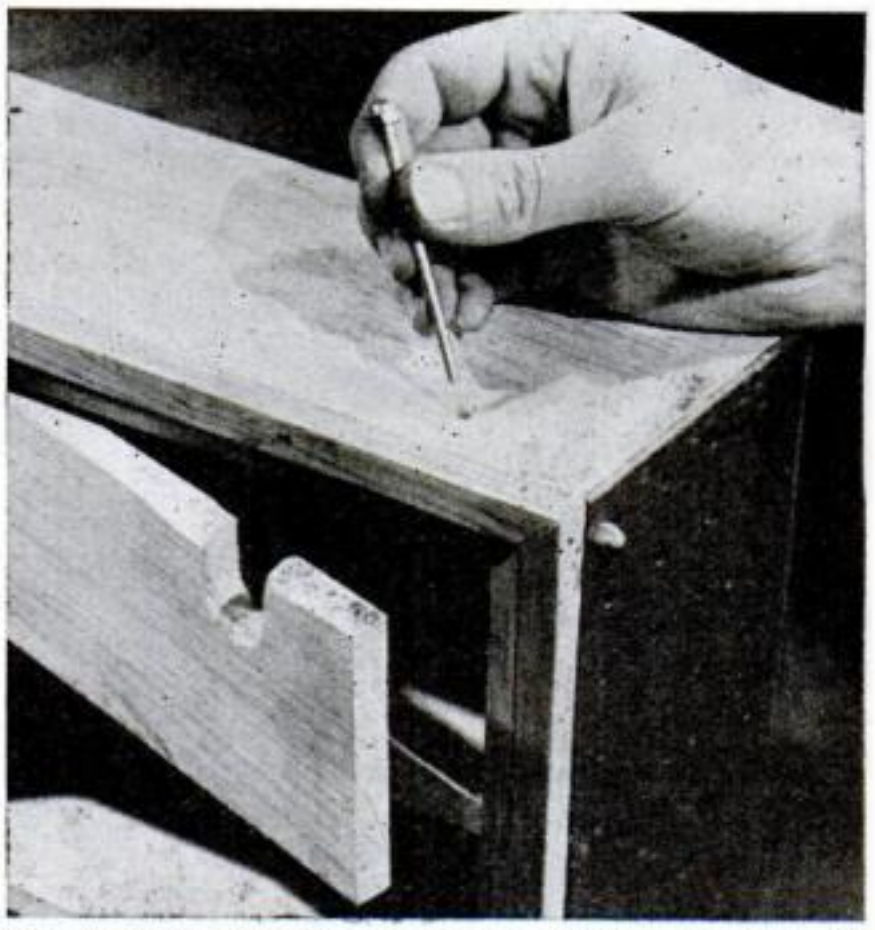
**SLIDING DOORS** are fitted after cabinet is nailed together and separator rods installed. Doors should overlap by only about ¼".



**DRILLED HOLES** a bit smaller than nails prevent splitting of wood. Make frames for cabinet face separately and tack them in place.

the sliding doors (they both slide in one rabbet) cut at the lumberyard. You can use solid ⅛" hardboard or the perforated variety known as Peg-Board, as I did.

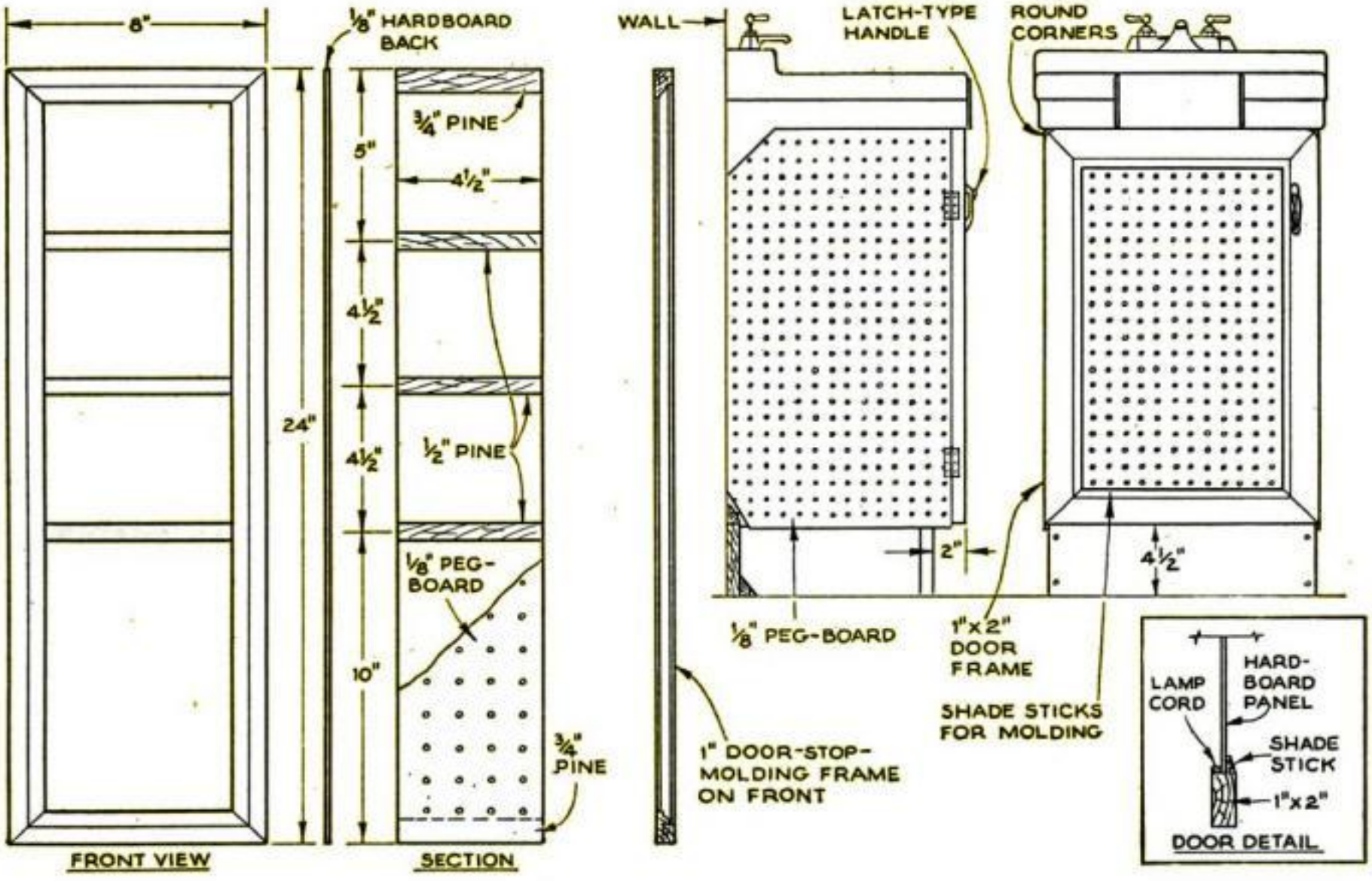
The compartment in the upper right-hand corner of the larger unit has a secret lock. You can store poisons there to keep them away from children. The door can only



**POISON CHEST** is locked with ⅛" rod. Top of rod is threaded to take cap bolt that prevents locking rod from dropping too far in hole.



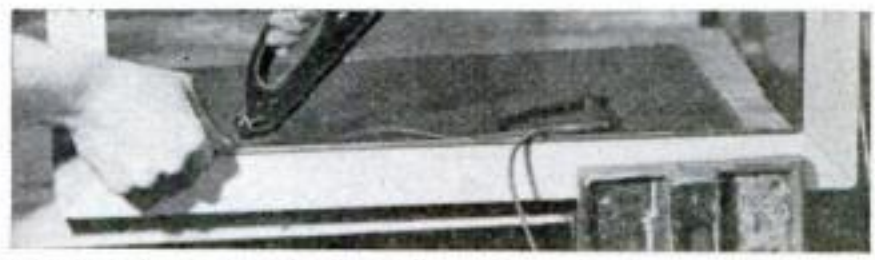
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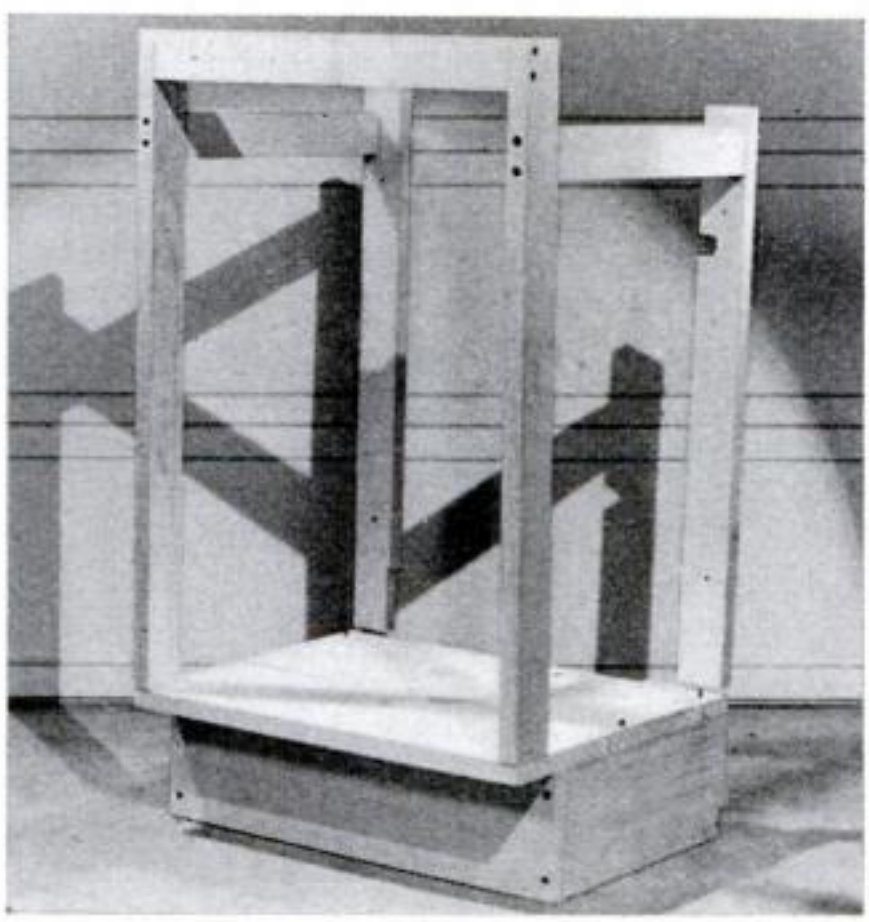

be opened after the locking rod is withdrawn from the top.

You'll need a 6-32 die and die stock to thread the curtain rods spacing the doors.

The under-basin cabinet, very handy to store cleaning supplies, is framed up from ¾" stock and finished to match. Be sure to leave access to the trap and valves. END



**BACKSTOP MOLDING** for hinged door of basin enclosure is plastic-covered lamp cord. Front molding is window-shade sticks planed flat.



**BASIN ENCLOSURE** is built around frame of one-by-twos. Unit is screwed to floor and wall. Right rear upright is notched for a pipe.



**FINISHED CABINET** has part of old dish drainer fitted on door to hold boxes of cleaner. Wooden rack holds other cleaning equipment.



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# How to Rig an Attic Ladder

***It can go into a closet, stay on the wall or fold up out of sight.***



**This homemade ladder,** 9′ long, hooks over header in attic hatch. Detached, it can be stored inside a nearby closet, which has a sloping wall under a gable (below). End of ladder with the hooks goes down near the eaves. A wooden turnbutton pivoted on the wall engages one rung to hold the upper end.



AN ATTIC you can't readily get into is about as handy as none at all. But even if the entrance to yours is a stairless hole in the ceiling, you needn't teeter acrobatically on a chair or stepladder. Instead, the answer is to rig a one-purpose ladder just to take care of attic access. It can be a simple bow ladder like the one shown here, or a fancy disappearing one as on the following pages.

***Try a mock-up first.*** Hatchway sizes and floor-to-ceiling heights aren't standardized, and working clearances are often snug. So first take the dimensions carefully and make a scale drawing. If you decide on a folding ladder, better make a full-size mock-up of it with a couple of sticks hinged the way the ladder will be. Fit this to the hatchway and follow through the motions to make sure there is clearance where necessary.

***Counterweight lightens it.*** There's no need to hoist up the full weight of a disappearing ladder. You can counterbalance it with weights, a light rope and one or more pulleys.

The weight need not hang over the hatchway nor anywhere near it, for you can run the rope over pulleys to any convenient spot, preferably near an attic wall. If height is limited, perhaps you can attach the counterweight rope higher up on the ladder. The weight then won't have to move as far, but will have to be heavier. Another dodge is to put a pulley on the weight itself, as in a simple block and tackle. The weight will have to be twice as heavy, but need travel only half as far.

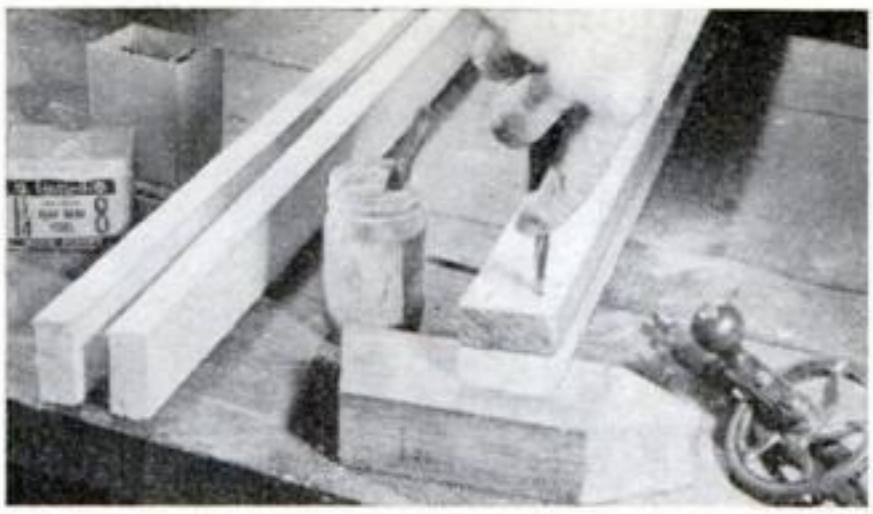
Don't counterbalance out all the ladder's weight. Leave it just a bit heavy so that it will stay down after you've fished it down with a pole or cord.

***Build for safety.*** Even if you use it rarely, the ladder must carry all your weight at once, plus anything you carry. So use screws rather than nails, and don't overlook the enormous holding power of good glue. Buy hinges that are on the large side. Be sure the screws that hold them are sunk deeply into sound wood.

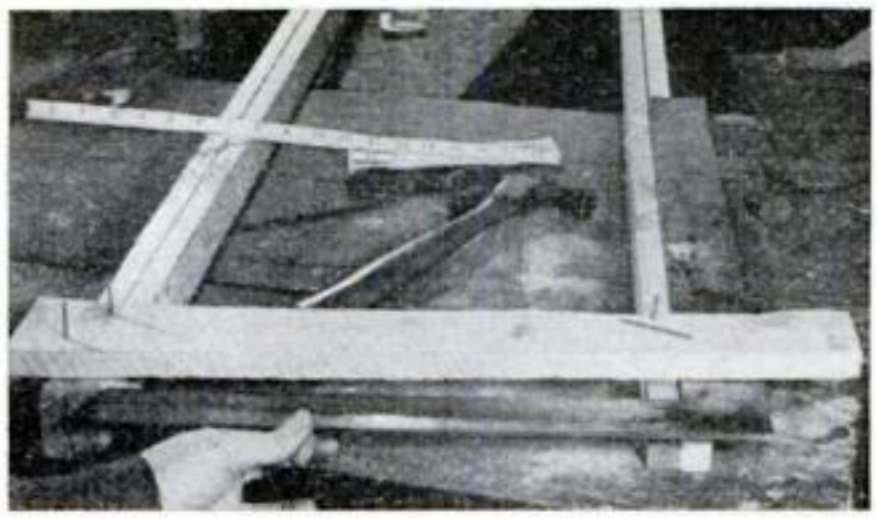
If yours is to be a removable ladder, use



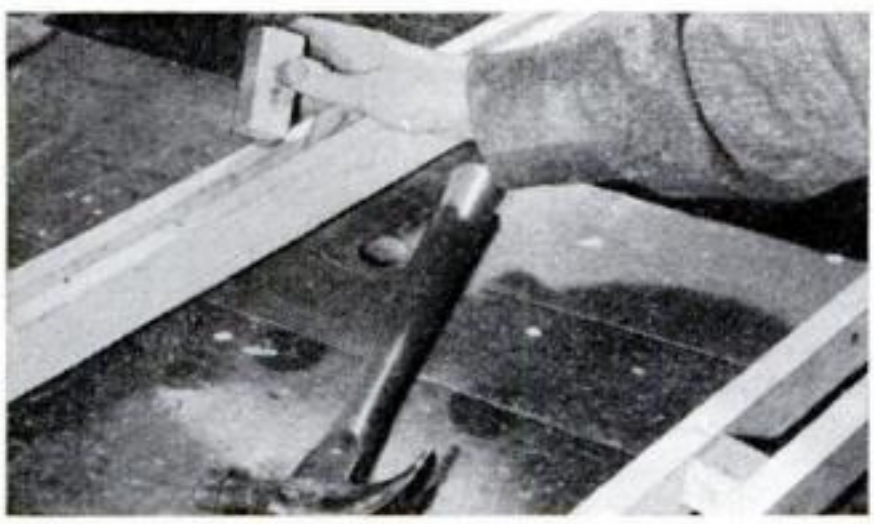
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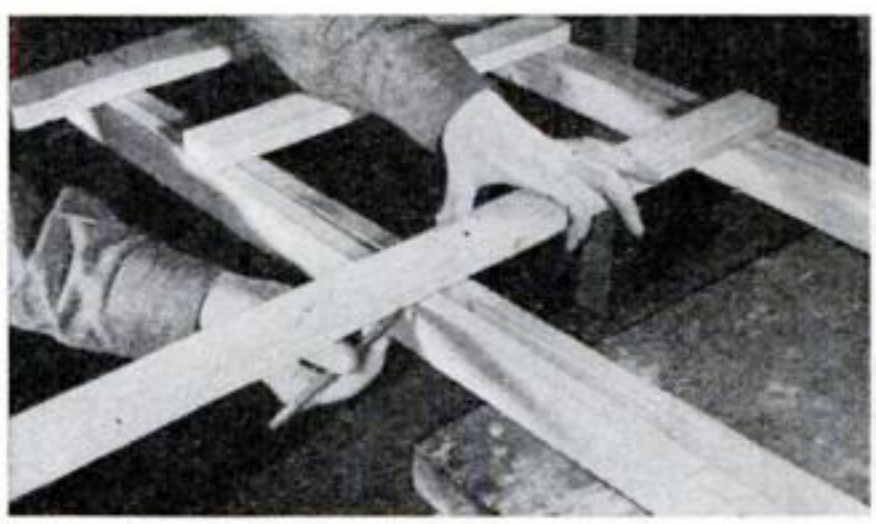
**1** **Cut four lengths** of 1" by 2" finished furring strips (actually 13/16" by 1⅝") to make the side rails. Apply glue for 2" up from ends and fasten each pair of pieces together like this, with two wood screws at each end.



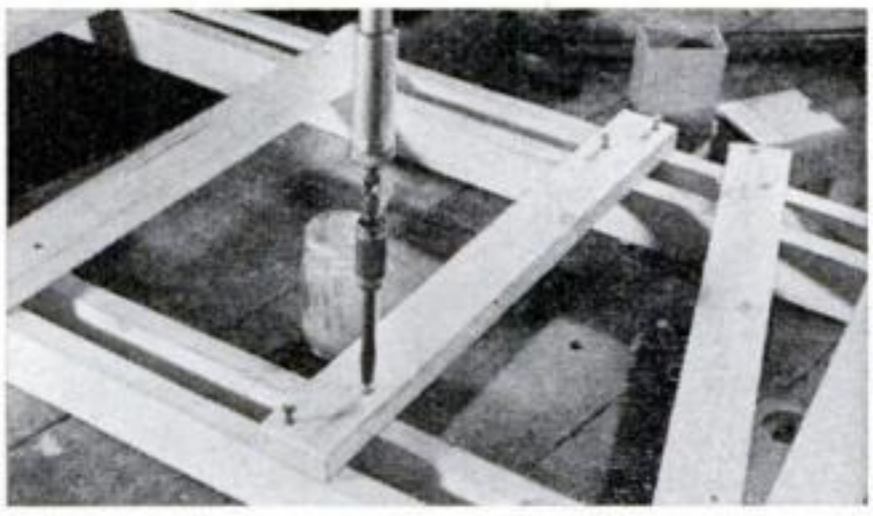
**2** **Nail scrap stock** across side rails to space them 16" center to center. Check for squareness across the ends. Tack similar piece at the other end, driving all nails only part way for easy removal later.



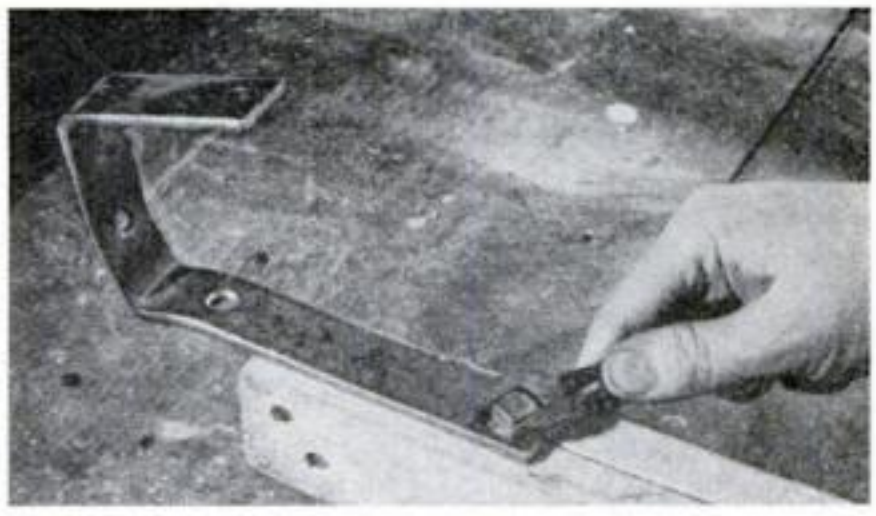
**3** **Find the middle** of the rails by measuring. Spring each pair apart and insert at the middle a temporary spacer block about 1¼" thick, to give rail pieces a slight bow (the bow adds strength). Lay out rung locations 10" apart.



**4** **Rung length** varies slightly because of bowing. The quickest way to get rungs right is to lay the stock (1" by 2", like rails) at each rung location and mark it off as above. Identify each rung by number.



**5** **Spread glue** on edges of rails where rungs go, and on undersides of rungs. Fasten each rung with 1¼" wood screws, one in each of four rail members. Stagger the screws as shown, and countersink them.



**6** **Open out bends** in 6" angle brackets a bit and make extra bend to hook over hatchway header. Attach each hook with at least one long through bolt and nut and one heavy wood screw. Bevel lower ends of rails to stand flat.

hooks or clips that will hold it securely to the hatchway header. Beware of a loose ladder simply set in position; if the feet slip, so do you.

To avoid the need for stepping on a chair to open the hatchway panel, consider hinging it at one end and securing the other with a cupboard catch, which can be released with a rod or pole. A loose panel, simply laid on a rabbet inside the opening, can be pushed upward at one end with a take-down ladder. Once this is hooked over the header, you can go up a couple of rungs and remove the panel.

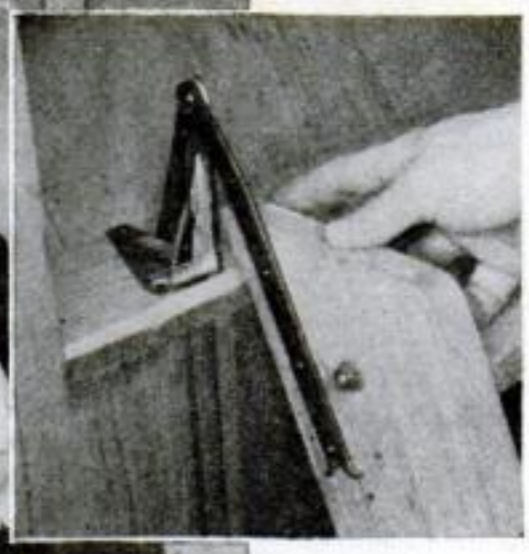
***An attic ladder can also be built to slide up and disappear. Turn the page.***

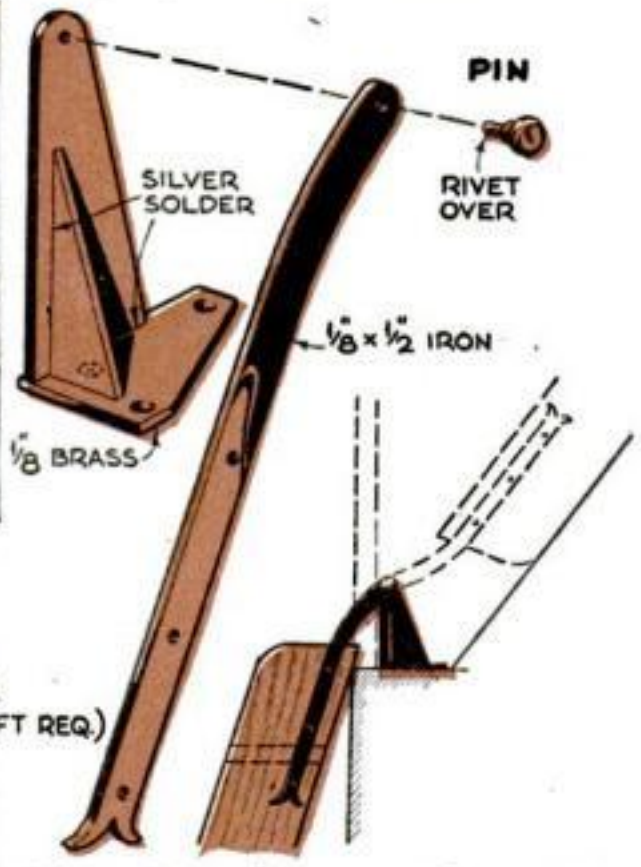


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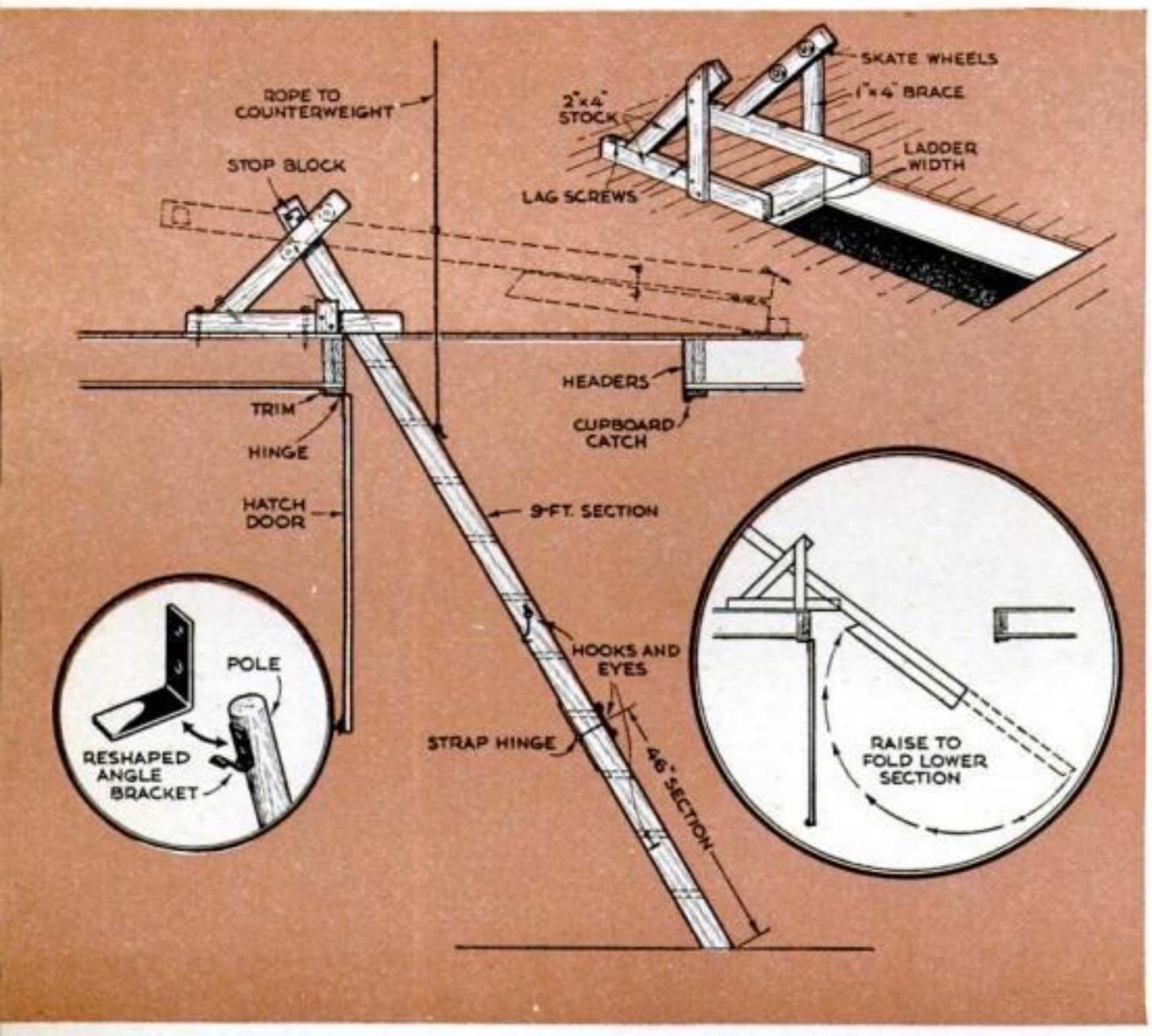
## Even though your attic-access








**Tuckaway ladder.** Some houses without attics have storage space accessible only through the upper part of a wall. To reach such a closet, W. A. Conway of Macedonia, Ohio, built this ladder. He used ⅞" oak, mortising the steps into the rails about 3/16". Rungs are further supported by rail-to-rail metal rods threaded at both ends for nuts. Special hinges pivot the ladder back of the closet-door line. They were made of brass plate silver-soldered together. Similar hinges could also be welded up from steel plate.

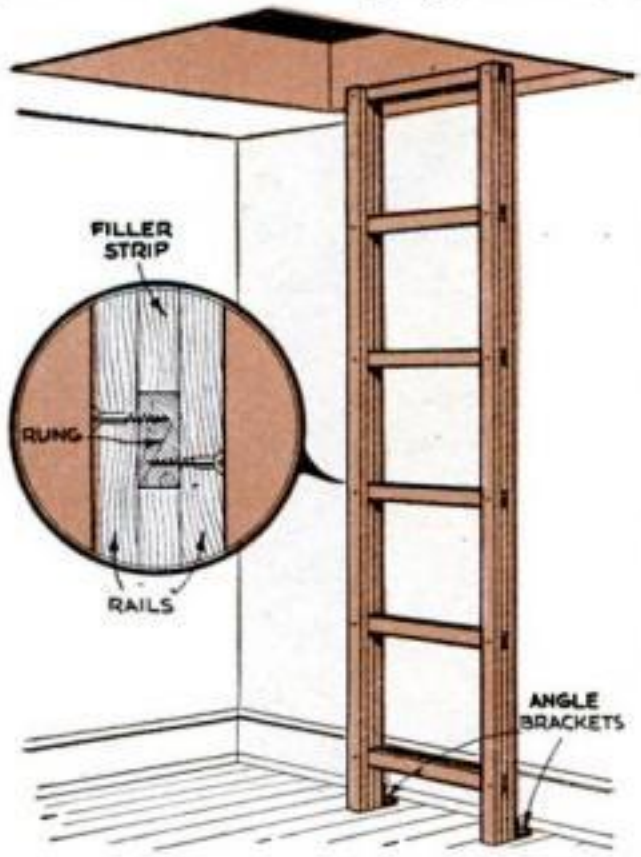



**Sliding ladder** is raised by aid of counterweight and folded to fit through the hatch. For room height of 8½' it requires an access hatch at least 42" long. Ladder can be made of 1⅛" by 4" stock with steps 11" apart let into grooves. Mount skate wheels with one long wood screw each. The counterweight should leave ladder a trifle heavy. Hinges holding the lower section are on underside, so load cannot buckle the ladder. The cupboard catch that secures hatch door can be released with the pole used to raise and drop the ladder.

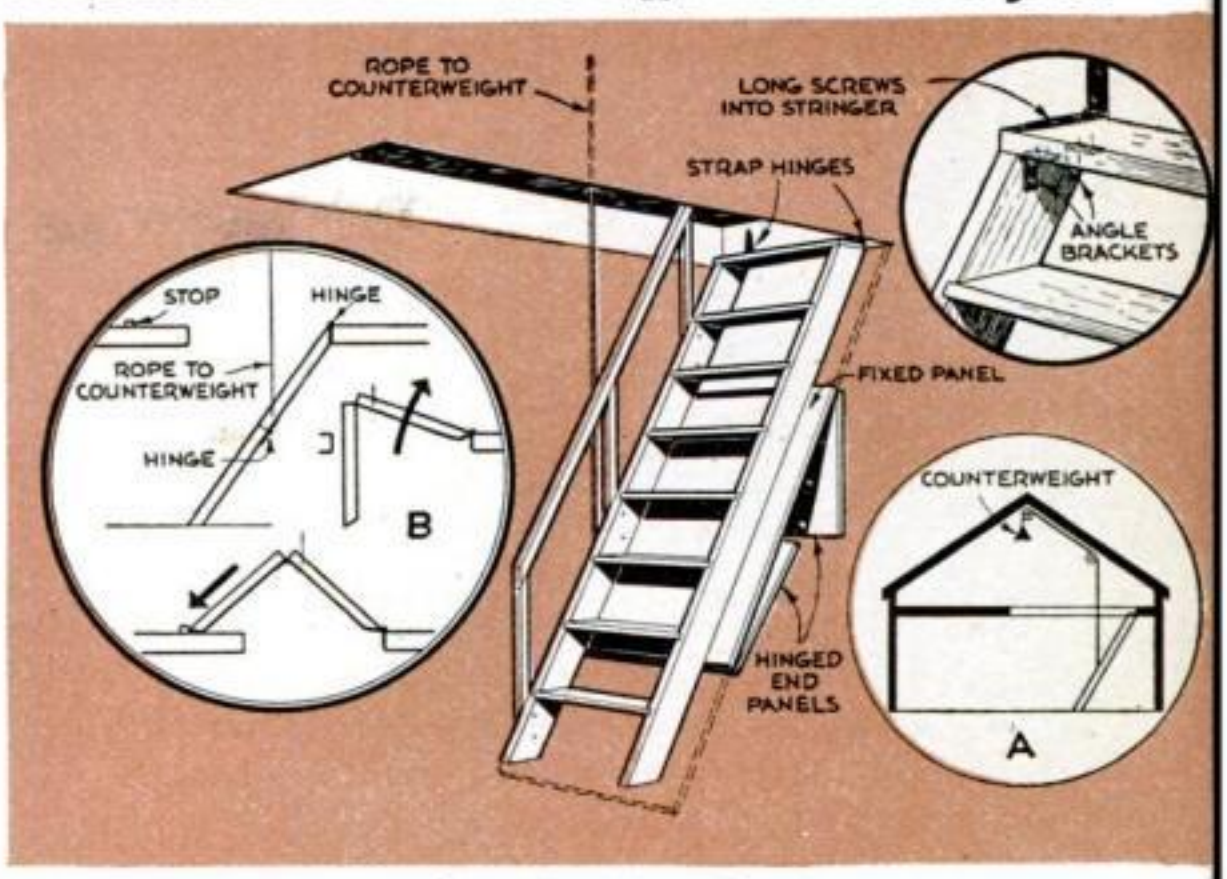


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***problem is tough, chances are that one of these rigs will do the job.***




**A wall ladder** permanently mounted is ideal if the attic hatchway is over a closet, and can be unobtrusive in a hall if painted the same as the wall. Furring strips make the rails. Vertical pieces inserted between the rungs help bear the load. Fasten ladder to hatch header and the floor, setting it a bit off the wall so that toes won't make scuff marks.




**Hinged one-piece ladder** is feasible only where hatchway is long enough to accommodate its full length. It can be counterbalanced as shown at *A*. The middle-hinged ladder at *B* requires less hatchway area. Since both ladders are mounted by hinges at the top step, hinge screws should be run into the rails, and the step should be fastened with husky iron angle brackets. An open ladder would be suitable for access to top floor of a garage, but in a dwelling the hatchway may be closed with a three-part panel fastened to underside of the ladder. End sections must be hinged to permit free action. With the ladder up, they can be swung up and secured with cupboard catches.

## Drawer Pulls Made from Dowels



HERE's an easy way to make pulls for small workshop drawers. Select flathead wood screws that fit the washers almost flush. Drill the dowel to take the screws and then saw the dowel into ½" pieces. Using bolts instead of screws through the drawer faces will make heavy-duty pulls.—*Will Thomas, Buffalo, New York.*

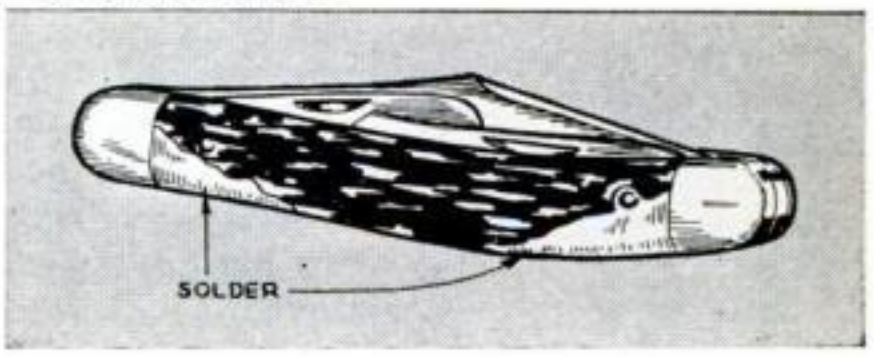


## Newspaper Masks Glass

WHEN painting sash, use pieces of newspaper to mask the glass. Cut the paper to fit, wet the paper and smooth it on the glass. It can be peeled off when the paint is dry.—*J. W. Rocke, Atkinson, Neb.*

## Solder Repairs Chips in Handle of Pocket Knife

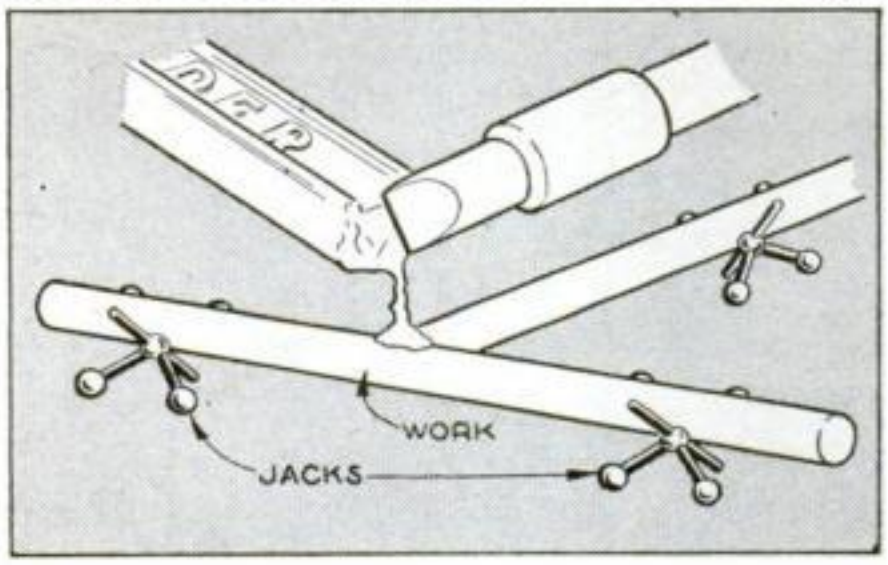
A CHIPPED or broken bone handle of a pocket knife can be repaired with solder. Clean the brass backing plate and then build up solder to fill the space where the bone is broken away. Smooth off excess solder with a file.—*A. L. Elliott, Sacramento, Calif.*






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## Metal Jackstones Aid Soldering



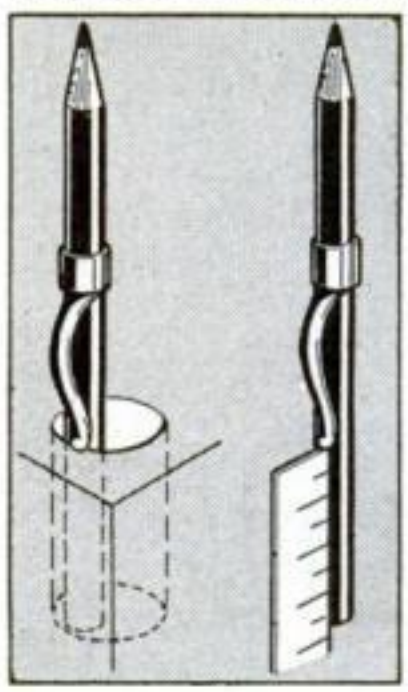

SMALL round stock is easier to solder if you support it on metal jackstones that you snitch from the kids' toy box. They hold the work off the bench, giving the solder a chance to flow completely around the joint. *—Howard E. Moody, Upper Jay, N. Y.*

## Hook Secures Ladder Shelf



A HOOK and eye—the kind used on screen doors—will prevent tipping of the folding shelf on a stepladder. The ladder itself will be more rigid if a hook is installed on each side of the shelf.—*Carlton G. Bucher, White Plains, N. Y.*

## Pencil Serves as Depth Gauge



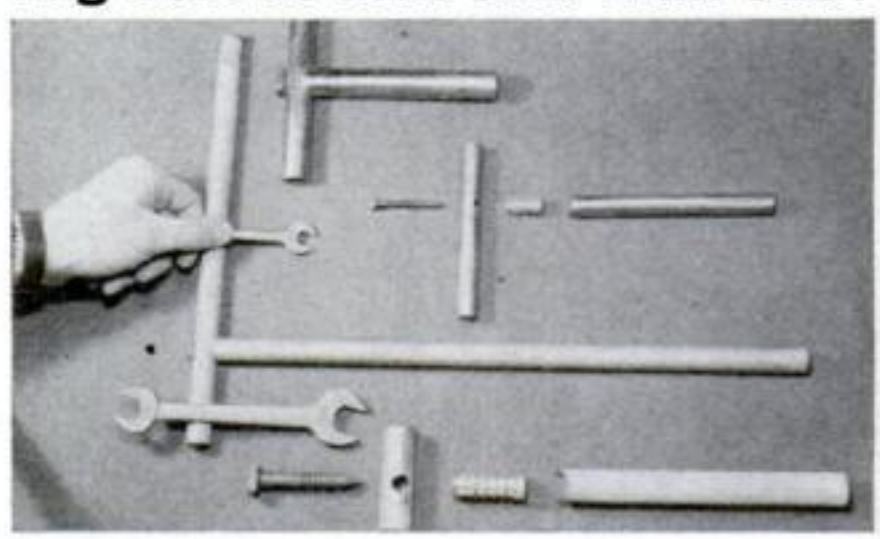
A PENCIL fitted with a dime-store pocket clip can be used as a rough depth gauge for many purposes. Rest the unsharpened end of the pencil in the hole and push the clip down until it touches the top of the hole. Then measure from the end of the pencil to the clip—*Walter F. Dierken, Dayton.*

## Shield Helps Pick Bent Corn



A POINTED shield bolted to the tool bar ahead of the rear wheel of this tractor straightens bent corn, keeping the wheel from grinding it down and enabling the mechanical picker behind to pull the ears. L. H. Maresh, Granger, Tex., made the straightener from a triangular piece of sheet metal, bending it to suit the wheel.

## Lag Screws Join Thin-Wall Tube



THIN-WALL conduit or copper tubing can be joined at right angles with lag screws and lead screw anchors. Use a hacksaw and a round file to shape the end of one piece. Drill a hole in the other piece. Insert the anchor in the shaped piece and join the two tubes with a lag screw through the hole. Screw anchors and expansion plugs come in sizes that will fit most tubing diameters. If you get some that won't quite fit, they are easy to file down.—*W. Haase, Hartford.*



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# Broom on Wheels Sweeps Your Lawn

***Retire your rake when the leaves start falling. This homemade sweeper makes the old raking chore a pushover.***

**By Howard G. McEntee**

NOBODY enjoys raking leaves, but I managed to live with the chore until a neighbor bought a lawn sweeper. He merely pushed it along. A rotary brush, driven by the wheels, whisked up grass and leaves into a cloth catcher behind it.

Here, I thought, was the answer to a lazy man's dream. Only the price tag kept me awake.

"That brush goes around about as fast as the blades of a lawn mower," I mused.

"Uh-huh," said the owner. "You know, I can pick up the whole yard in 12 minutes. Beats raking, doesn't it?"

"But the brush runs opposite to the way a mower reel does," I went on.

"Yeah. I use it for grass, too. Instead of emptying



**LOOK, NEIGHBOR—NO RAKE.** You make a clean sweep of lawn debris just by pushing this converted mower along. A rotary brush driven by the wheels leaves no leaf unturned.



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**THIS OLD MOWER didn't look like much, but had all its working parts. Reel bearings need not be perfect, because adjustment of the brush is not as critical as that of mower reel.**

a mower bag every few yards, I keep moving, and sweep up later. Faster, and easier on the back."

I took the plunge. "Wonder if I couldn't make a sweeper out of an old mower."

"Not a chance. You'd need new gearing to make the brush turn the way this one does. Besides, a mower isn't wide enough. Don't waste your time," said my pal, and swept off.

***So I tried it.*** Shopping around, I found a husky old mower for a buck. It had no handle, but the reel bearings, wheels and pinions were okay. Next, I bought a set of replacement brushes sold for factory-made sweepers—two V-shaped metal strips, each with two rows of bristles crimped into it. Another kind, four to a set, has a single row of bristles set into a wooden strip. This kind would probably have done just as well.

Taking apart the old mower, I cleaned the parts in kerosene. I took the bearing cones, ratchet pawls, and pinions off the reel shaft, removed the shrub bar, roller and roller brackets, and wondered what next.

***Big brush, small frame.*** My armful of bristles would make a rotor 10″ in diameter, but the reel bearings were only 3″ above the ground. And the shrub bar, that husky thing out front that bends the dandelions down, was only 4½″ from those same bearings.

Once the shock was over, I got an idea. Turning both side plates upside down would put the reel bearings much higher. It wouldn't move the shrub bar any farther out, but maybe I could trim an inch off the brush diameter and still get by.

How to squeeze 24½″ of brush length between the sides of an 18″ mower was the next problem. It was easy enough to cut a longer shrub bar from stock the same diameter as the old one. On mowers in which this bar is clamped by setscrews, that's the whole job. Mine had to be different, making me shoulder down and thread both ends.

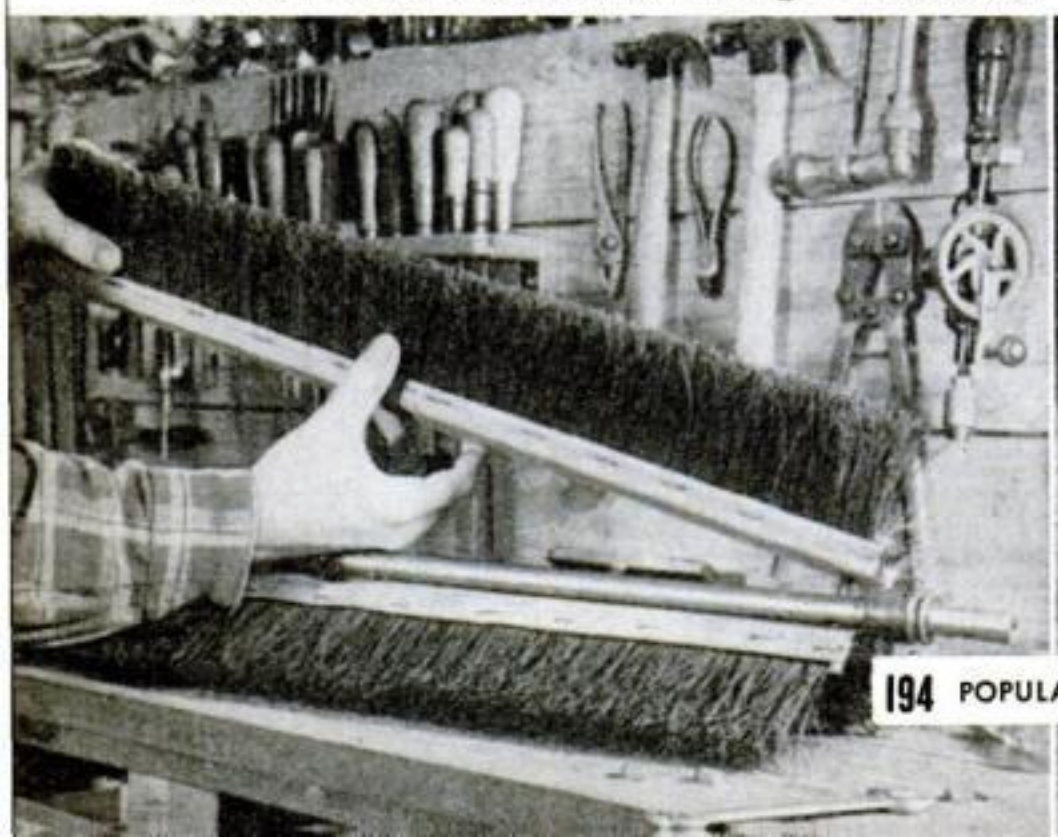
To hold the side frames apart at the back, I cut a length of angle iron square at both ends and clamped it in with a long rod threaded for nuts. The rod goes where the roller-bracket bolts used to be.

***Shaft is close copy.*** The only fussy part of the job was making a new shaft for the brush. It had to be the same diameter as the old reel shaft, for the bearing cones, pinions and pawls had to fit on it. The little pawl slots had to be spaced so that the pawls would line up inside the pinions.

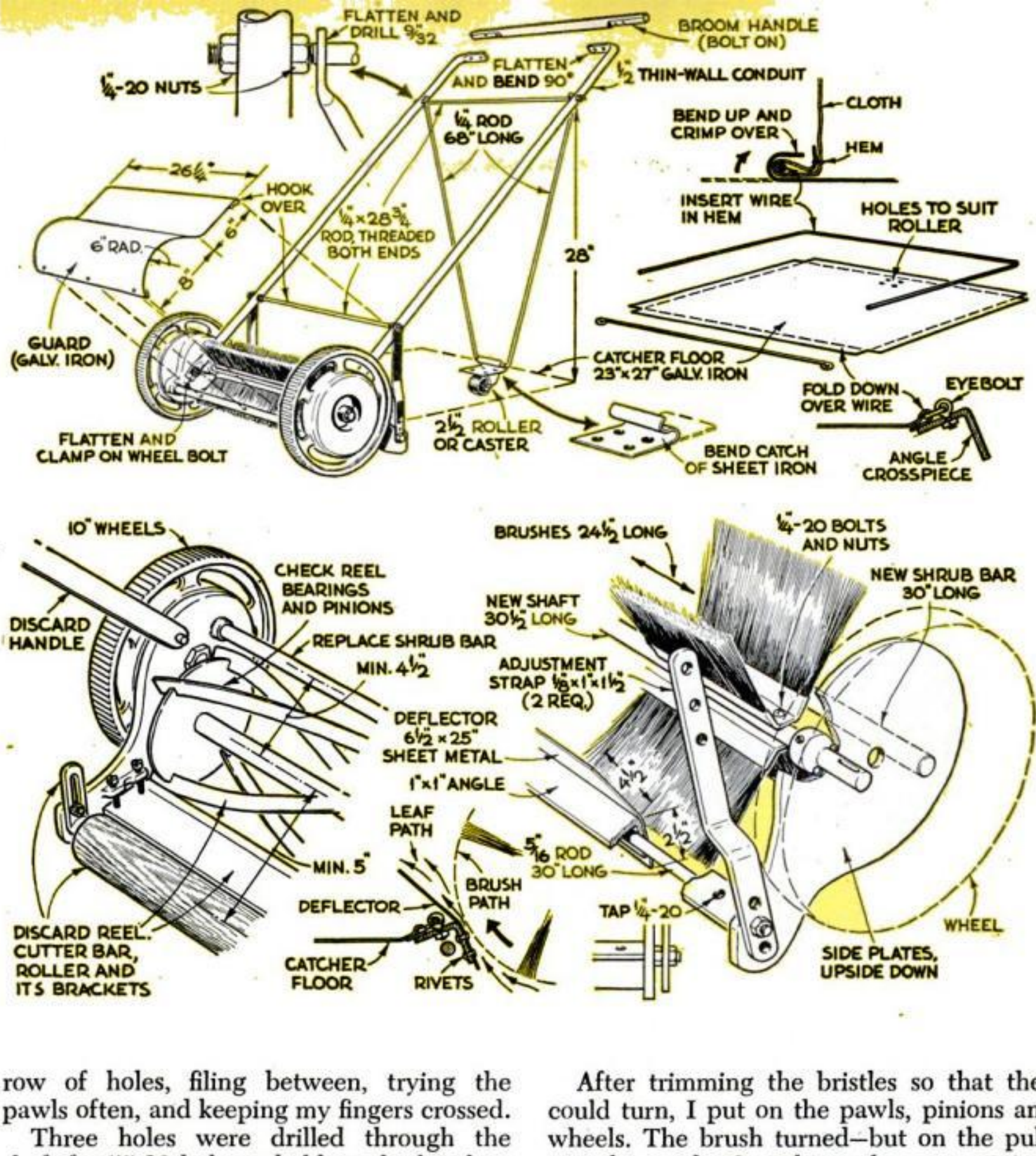
End milling would have done a neat job on the slots. But I made them by drilling a

**NEW EXTRA-LONG SHAFT was made for the brush. Pawl slots were filed out to duplicate those on old shaft. Two-section brush was attached with three bolts through the shaft.**

**BARBERING JOB was done to make brushes pass the shrub bar. The bar was used as a guide in clipping the bristles. Flattened ends of handle slip on wheel-retaining bolts like this.**







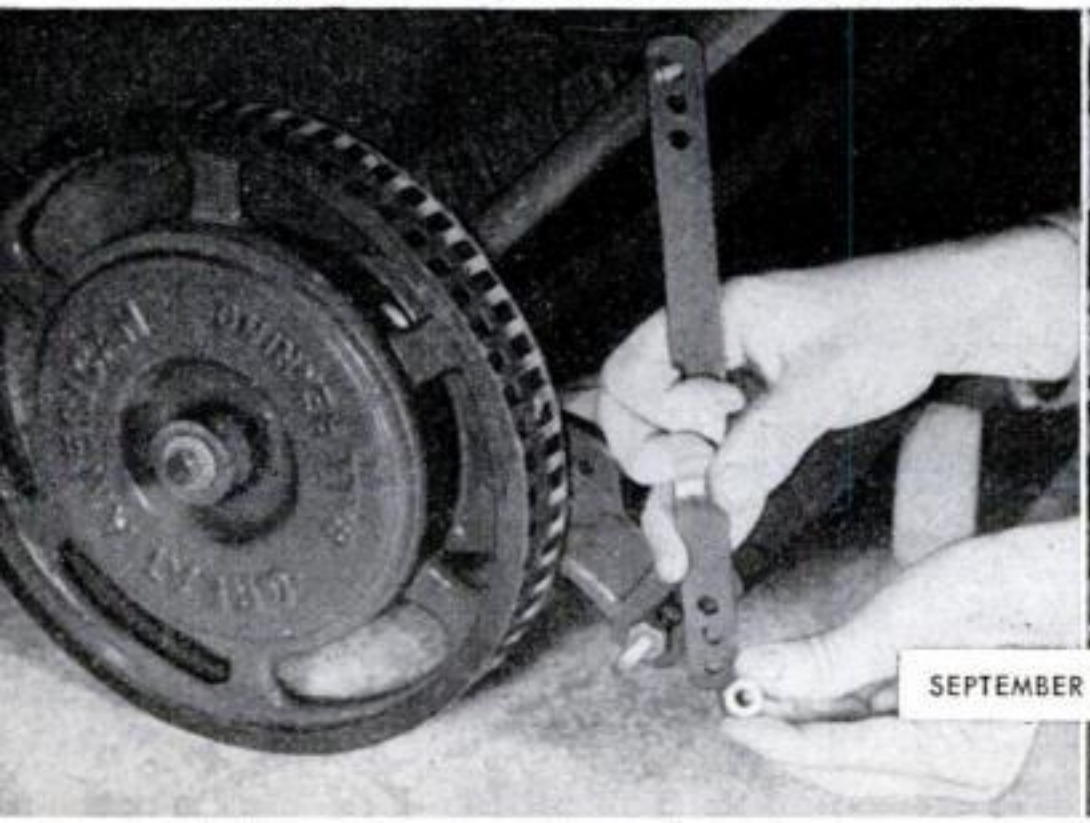

row of holes, filing between, trying the pawls often, and keeping my fingers crossed.

Three holes were drilled through the shaft for ¼"-20 bolts to hold on the brushes. The assembled job looked like business, even if it wouldn't turn past the shrub bar.

After trimming the bristles so that they could turn, I put on the pawls, pinions and wheels. The brush turned—but on the pull, not the push. Switching the two pinions around, however, made it turn forward, like any mower reel. For smooth running,

**BRUSH HEIGHT** above ground can be altered by two straps like this. They link the lower handle-bar rod to the 5/16" rod joining the side plates. Six holes provide adjustment.

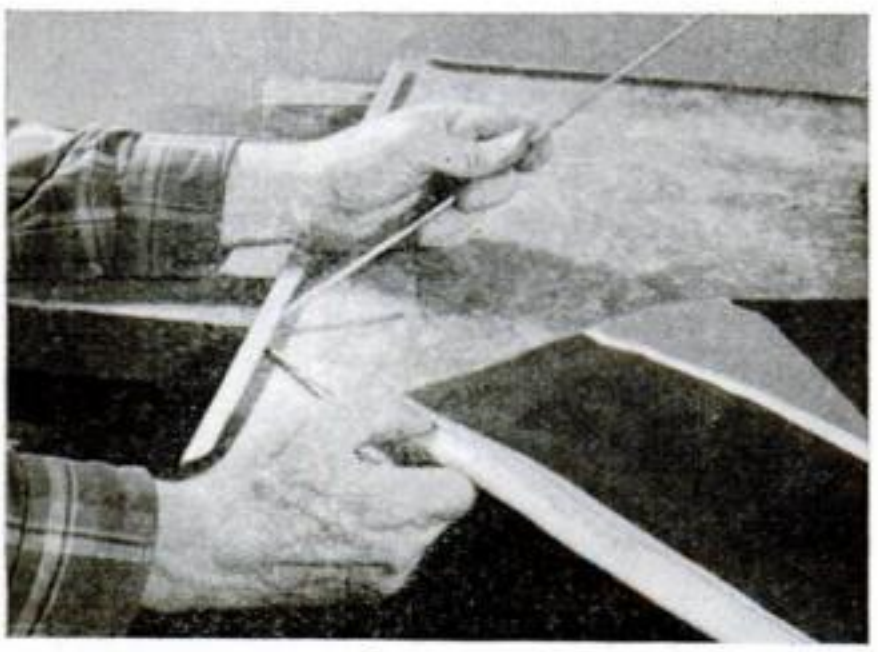
**SMOOTH CURVE** was shaped in the sheet-metal leaf guard by clamping it to one of the lally columns in the cellar with a length of angle stock, and then bending it around.



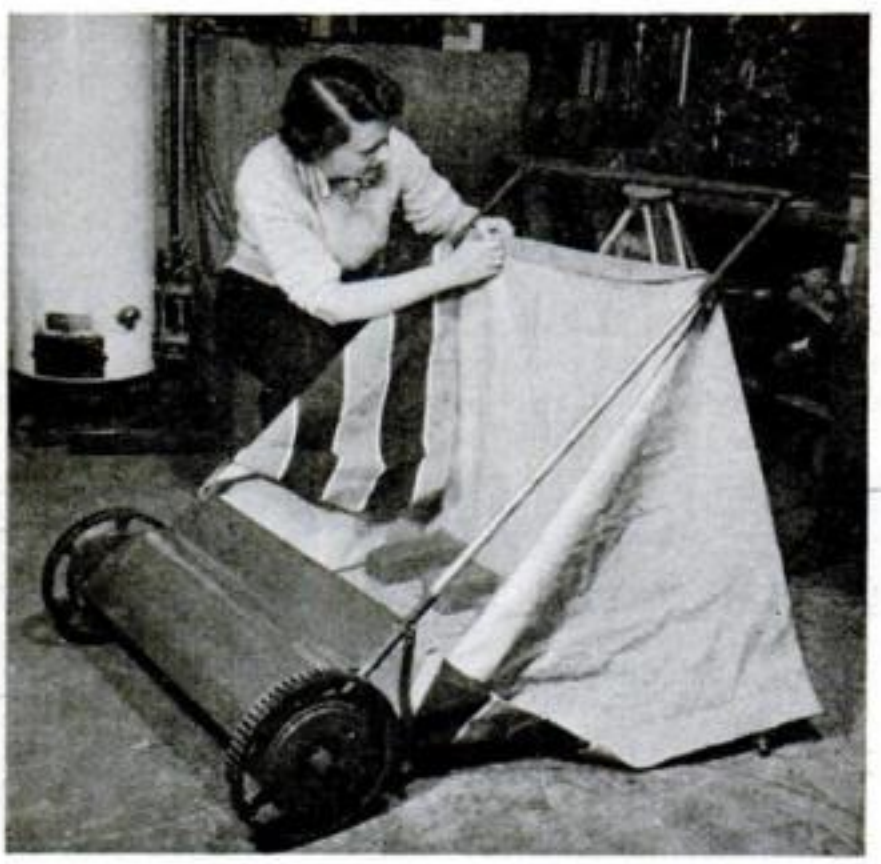




**CATCHER FLOOR is cut from galvanized iron with a bending margin all around, as in the drawing. Edges are then turned up over a ¼"-thick iron bar clamped on top of the sheet.**



**REINFORCING WIRE bent to shape of the floor is pushed through hem of the bag canvas. Wired hem is then slipped under turned-up edge of floor and, after sewing is done, crimped in.**



**WITH FLOOR IN PLACE and handle blocked up to pushing height, the canvas is draped over handle rails and upper rod and pinned. Handle and cross rod have to be removed to slip the canvas off for sewing on a machine.**

the little pawls must of course have their curved faces turned the way the brush goes.

When nobody was looking, I ran this contraption over some leaves. It threw them in every direction, mostly up.

***Routing the traffic.*** Some leaves were shot back under the angle-iron crosspiece. To stop that, I riveted on a bent strip of galvanized iron and set it at a tilt-back of about 25°. It takes a nimble leaf to get under that.

Two pieces of thin-wall conduit were flattened at both ends and bent at the top to form the handle rails. Through these run two ¼" rods, one up near the wooden handle, the other a little above the wheels. This one holds the upper edge of the leaf guard, as well as two adjustment straps. With the guard on, any leaf not landing in the catcher just makes another trip around.

***Catcher rides on roller.*** The sheet-iron catcher floor, hung on the deflector bar with eyebolts, is supported on a roller at the back. I bought one made for a sweeper; but a husky caster would do, or even a slice of rolling pin mounted in a homemade U-bracket. A wishbone bent from ¼" rod pivots on the upper cross rod and snaps into a homemade catch fastened above the roller. This lets me fold up the catcher for storage.

***It's in the bag.*** Awning canvas 32" wide was hemmed on one edge. Then I bent heavy galvanized-iron wire to fit the catcher floor, which I had cut with a turnover margin all around. I slid the bent wire into the hem and slipped this reinforced cloth edge into the bent-over edges of the catcher floor. With the sweeper handle held up at working height and the adjustment straps at the lowest position, the canvas was pinned in place for sewing.

This was done on an ordinary household machine with an upholstery needle and thread. With a little help, it got through the tough spots where three thicknesses lapped.

The bottom hem was again set into the floor and the metal clinched down over it. Then the bag was slipped over the hand rails and the cross rod pushed through.

After the metal parts had been given a coat of primer and enamel, I rolled the gadget out and gave my yard a once-over. It made a clean sweep of leaves, twigs and grass. My neighbor came over.

"The thing seems to work," I said. "And it really wasn't hard to build."

"Course not," he answered. "Don't you remember? I told you so. . . ." END



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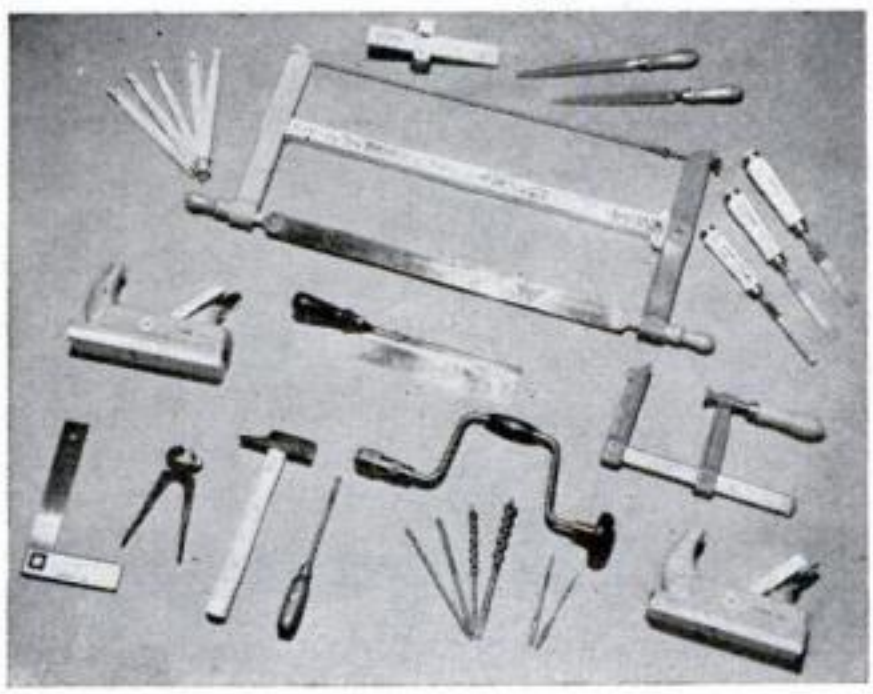
## Free-Rolling Stand Holds Globe



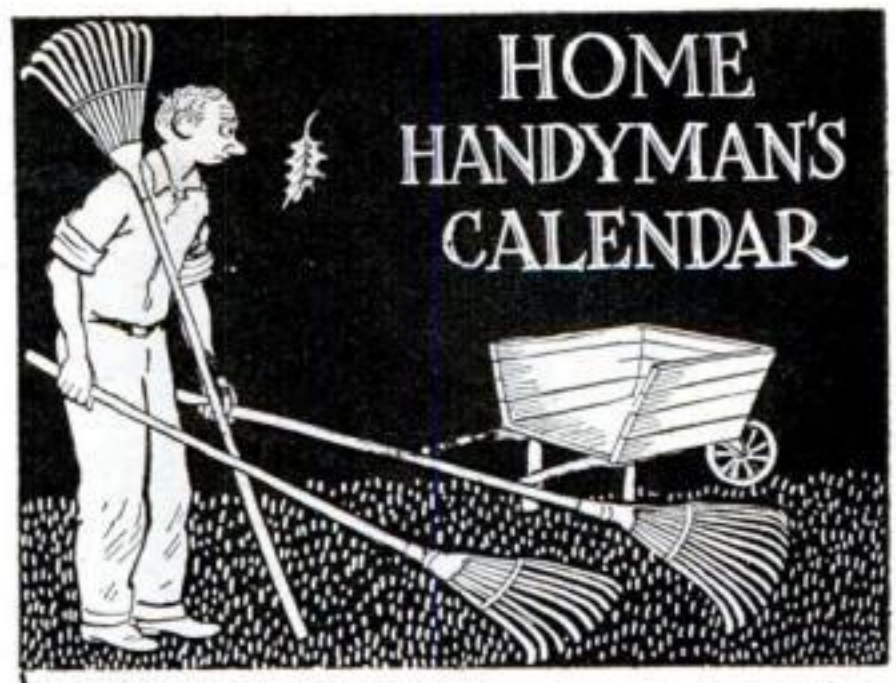
GLOBES mounted on a polar axis are out of date in the air age. A plane flies over the earth's surface on the shortest possible route—often over the poles. Only a free-rolling map can follow its course.

To convert a standard polar-axis-mounted globe to a free roller, remove the spindle rod and mount the globe on a three-point caster base as shown. Use good quality ball casters. Space the arms equal distances from the center and slope the top of each support arm inward about 45°.—*D. M. Desoutter, London, Eng.*

## Tools for German Apprentice



THESE are the tools a German youth must own before he can sign on as a carpenter's apprentice. Because some youngsters have no money to buy the tools, CARE (20 Broad St., New York) has arranged to deliver the kit to any point in Berlin or West Germany that an American donor may specify. Made by a German firm, the tools cost donors $20 per kit.




**September** means the end of summer and the beginning of falling leaves. Get your leaf cart and rakes in shape before leaves turn brown and shower down with the first frost. Or better yet, build the sweeper described on page 193. If you haven't tended to it yet, put in a supply of fuel. Finish outdoor masonry jobs. Drain outside water lines and store hose on reels in the basement. Repair and clean roller shades and Venetian blinds.



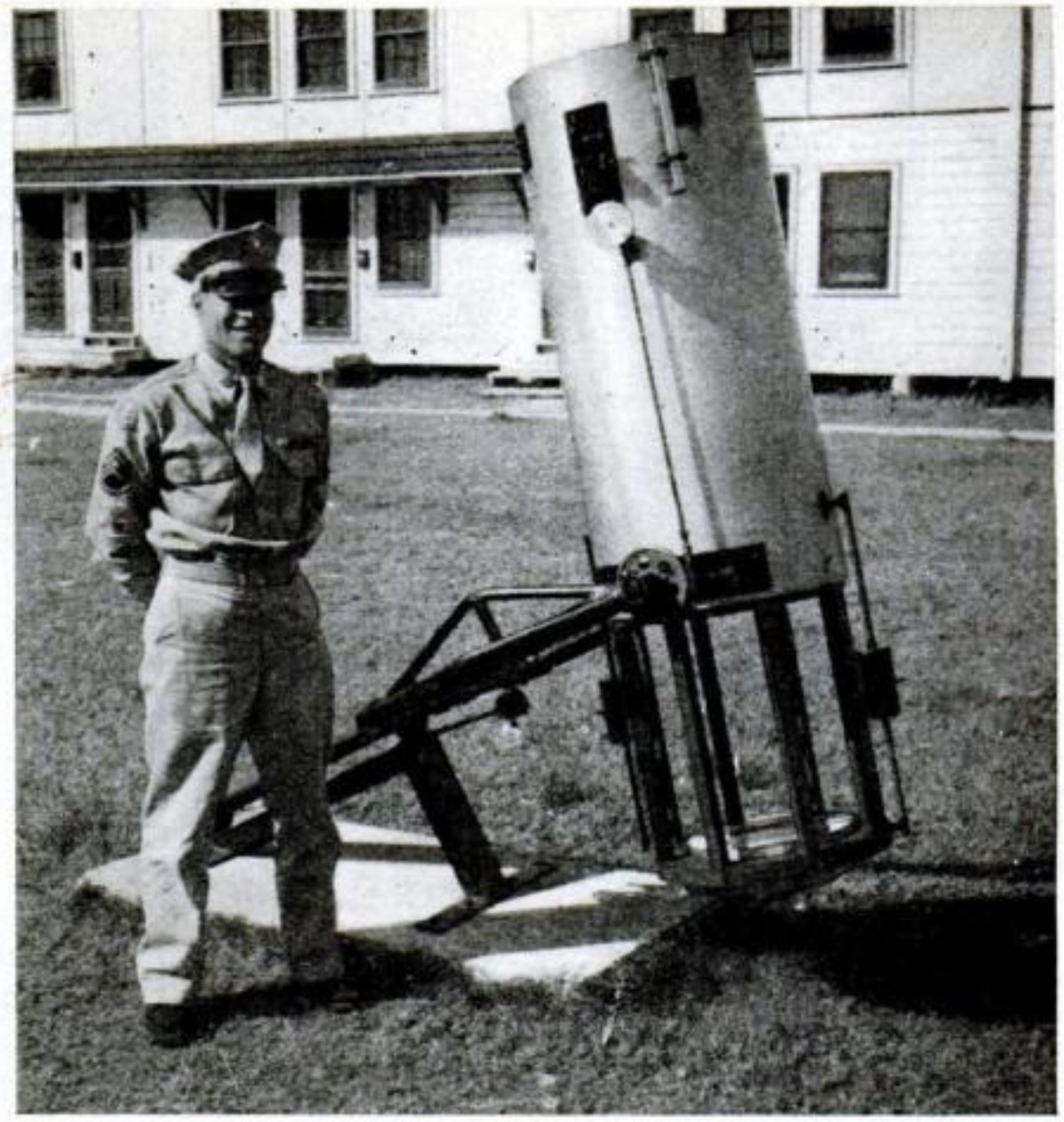
- Remove awnings, make any needed repairs and store them for the winter. Prune trees and seed the lawn. Oil and store electric fans. Close windows and vents in attic and basement. Paint and repair storm sash. Check your heating plant yourself, or else have a serviceman make sure the plant is in top shape for winter's first cold day. Are your grounds and fences in condition to take winter's first blast?
- Clean grease trap and septic tank, and make sure the field drains are functioning properly. Inspect and clean, if necessary, all plumbing traps and drains. Clean and grease the lawnmower and store it for the winter.



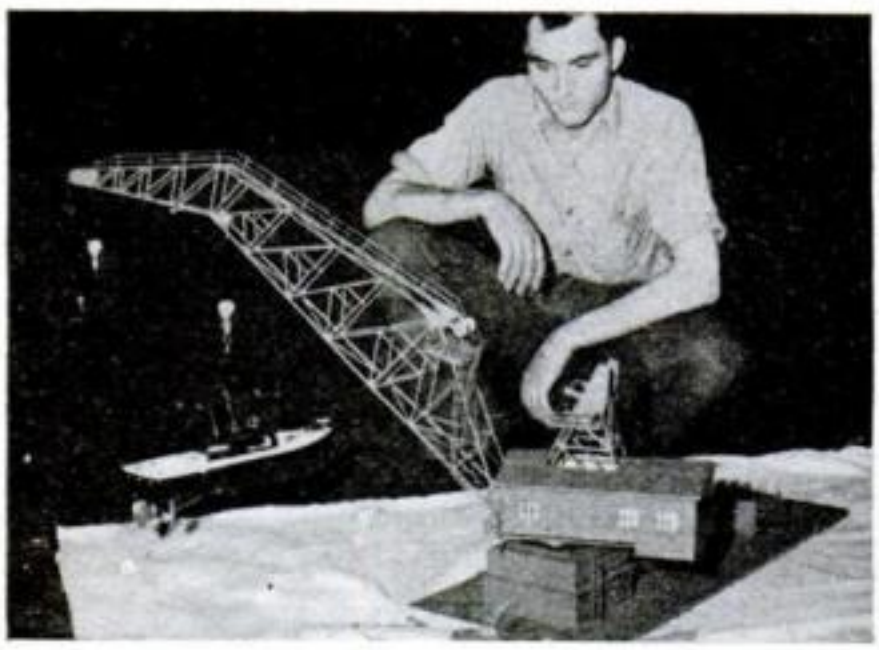


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# Craftsmen in Uniform



**One of 57 Inventions.** The Newtonian-type reflecting telescope beside Air Force T/Sgt. Donald A. Vorhies (right) is his own handiwork. He ground the 15″ mirror as well as the other optical parts. The telescope can be changed to a more complex type. The Sergeant reports that since 1943 he has made 57 inventions. Among them is a dismounting machine for changing the huge tires of heavy bombers, said to have saved nearly a million dollars a year during the war. It enabled eight men to do the job (40 were needed before) and cut tire damage to one percent of the previous rate. Other devices developed by Sergeant Vorhies, holder of the Legion of Merit for his work, include an emergency escape seat and a tripping device for training-parachute harness. Sergeant Vorhies, now at Kirtland Air Force Base, N. M., says he builds a project first, "designs" it later by having drawings made.



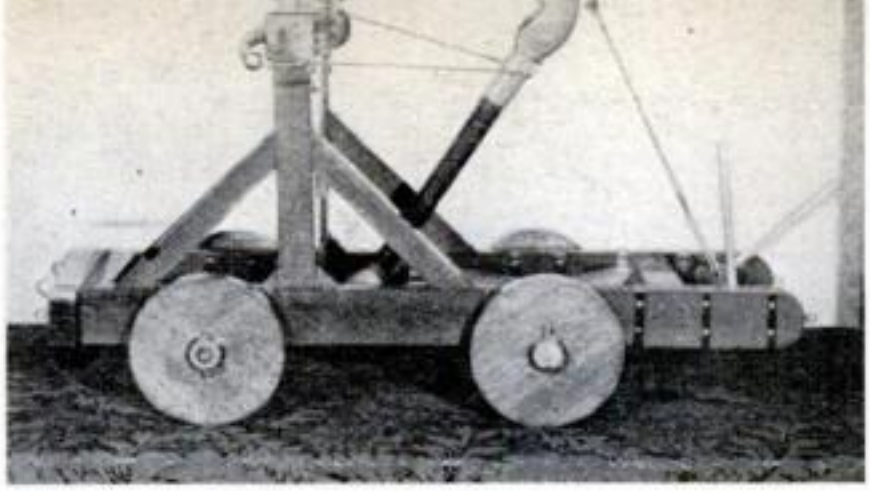
**Lifts 50 Tons—in Miniature.** James J. Luke, Aviation Structural Mechanic Second Class, began this model crane as a toy for his son. When he finished, 380 work-hours later, it was so complicated that it's all he can do to run it himself. A copy of a 50-ton Navy dry-dock crane, it has five electric motors, 13 switches, four-step voltage control. The gears came from eight clocks. Luke made it aboard the USS *Rendova;* he's trying to simplify it for his boy.



**Remote-Control Model.** You can pilot this 36″ Chris-Craft with a flashlight. A rotating photoelectric tube triggers relays that control electric motors, moving them through the sequence of stop, forward, stop, turn, stop. A single motor with a centerline prop drives the boat forward. Two other motors drive outside props of opposite pitch to turn it. The model was built by Army M/Sgt. Kenneth J. Stohlmeyer of the ROTC unit, University of Detroit.



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**Ballista Ballistics.** This handsome model shows a medieval siege gun—the rock-hurling ballista. The throwing arm, cradling a missile, is winched down flat against the tension of the horizontal bow. Released, the arm snaps upright and heaves the rock. M/Sgt. Norman C. Krischke of the Air Force took about 300 hours to build the catapult, using a picture as a guide. The materials, which cost $5, include nine kinds of wood, plus brass, lead and leather.



**Customized Scooter.** The snappy little runabout above started out as a three-wheel Cushman scooter. Cdr. O. B. Stanley Jr., Naval Auxiliary Air Station, Kingsville, Tex., added body and seats, moving the controls forward. The body is partly new black iron, partly pieces from junked autos. The car has two forward speeds and reverse, cruises at 35 m.p.h. with a 40 top, makes 41 miles to the gallon. It seats two adults—or Commander Stanley and his four kids.




**"It Won't Work."** That's what the Seabee builders named this vehicle when they set out to make it. They put in 300 man-hours of the spare time that hung heavy on their hands at the Naval Arctic Test Station at Point Barrow, northernmost point of Alaska. Now their power ski-sled makes 45 m.p.h. over snow and ice—and they don't dare let it all out on the rough Arctic terrain. It is powered by a salvaged 95-hp. Mercury engine, rear-mounted beneath the shaft of a second-hand propeller. The transmission uses two jeep differentials and a universal. The chassis is reworked from an old portable welder. The body is ¼" plywood with ½" angle-iron framing. There's no radiator fan—the prop draws air in through the engine housing. Driver First Class M. E. Wood, (right above) designed and built the sled with the help of Driver First Class G. L. Montgomery (left) and Driver Third Class W. J. Gallaher (center).

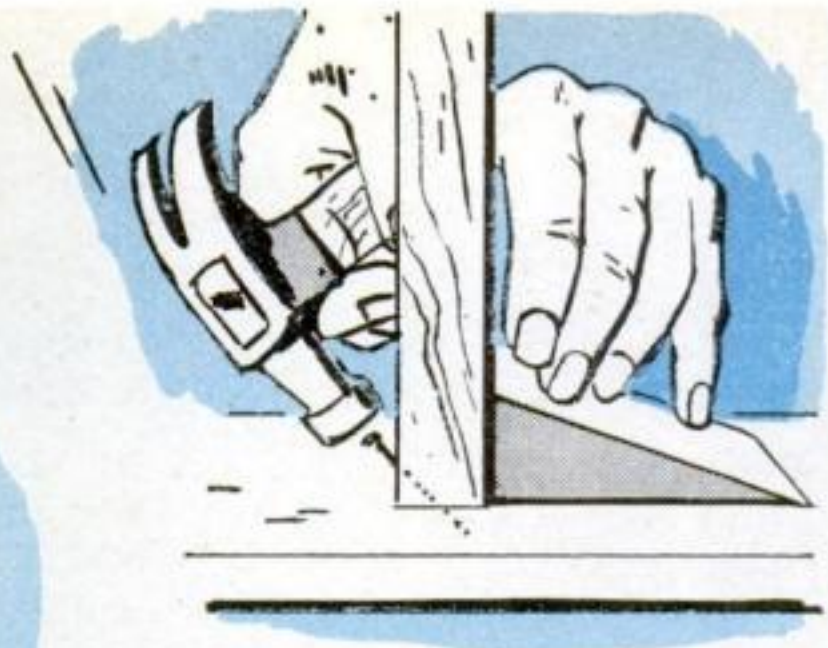


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# Keeping the Home Shipshape



**A tote tray** made from bread tins will hold all your small tools as you make repairs around the house. It's handy for a housewife, too, for carting cleaning supplies from room to room.



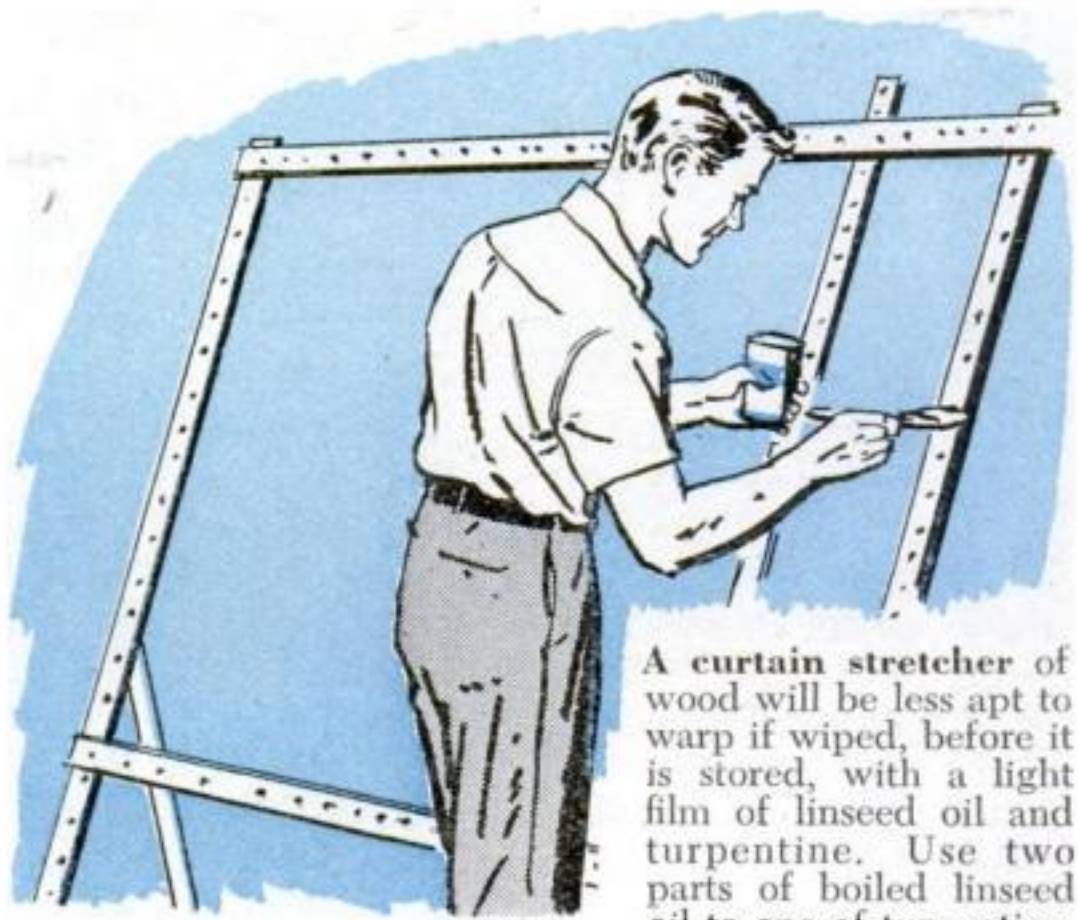
**When toenailing** light pieces of wood, a rubber door wedge helps. It holds the wood squarely in place, and the rubber won't slip.



**When the cover won't budge** on a screw-cap jar, try holding an eraser between your fingers and the threaded rim of the lid. It will give you a better grip.



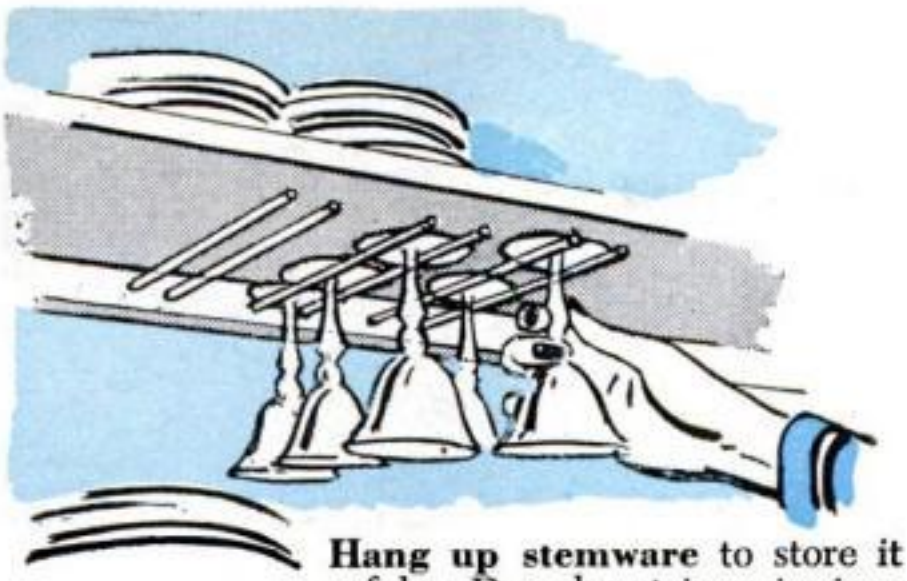
**Blueprints** are an eye-catching wall covering for part of a boy's room or a basement room. Apply the prints to the wall with wallpaper paste.



**A curtain stretcher** of wood will be less apt to warp if wiped, before it is stored, with a light film of linseed oil and turpentine. Use two parts of boiled linseed oil to one of turpentine.



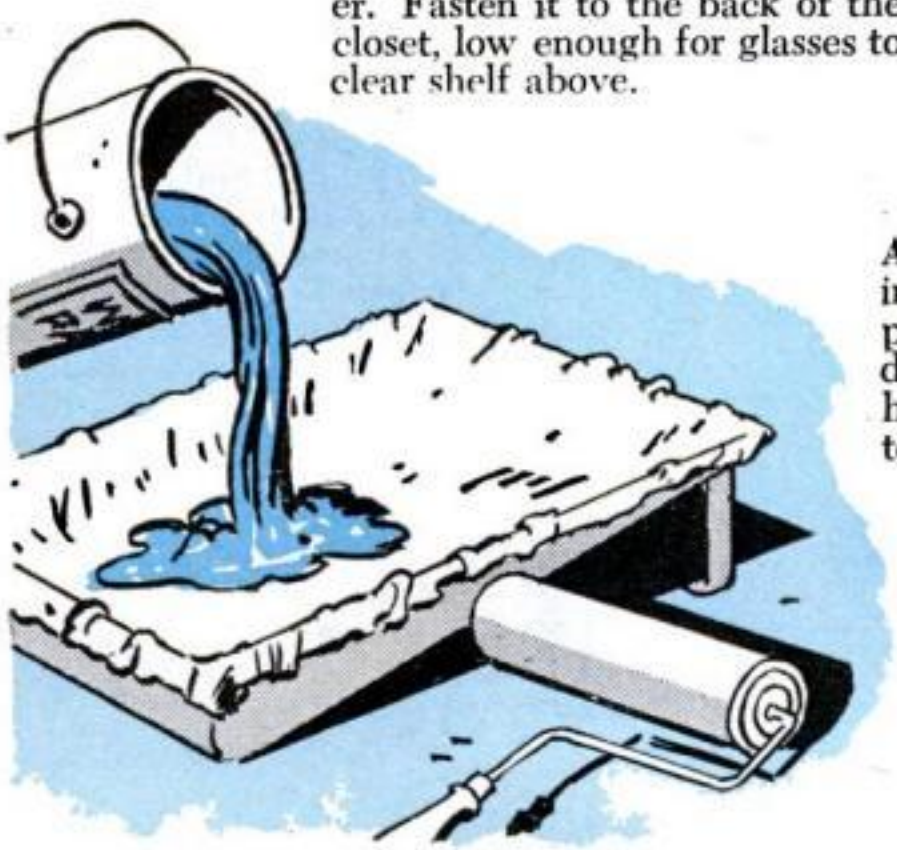
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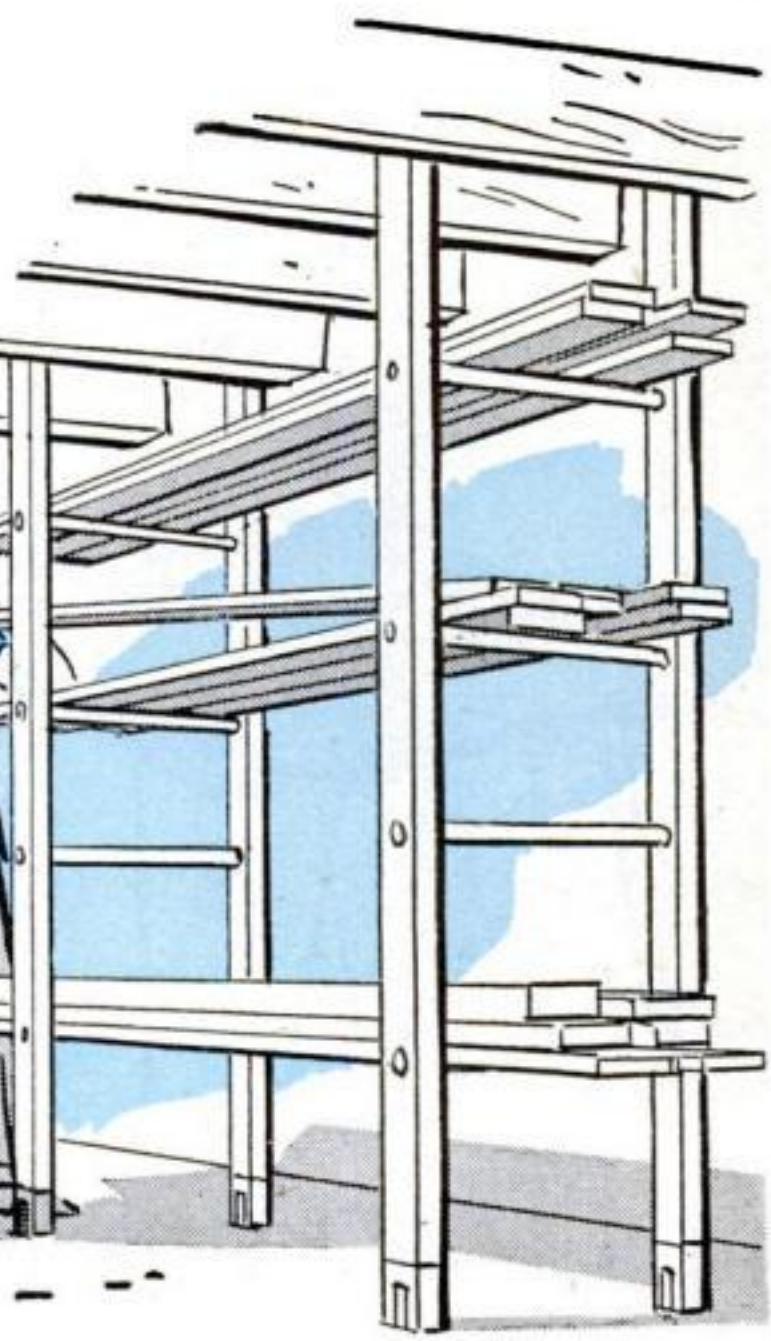
**Hang up stemware** to store it safely. Dowels set in pairs in a strip of wood make a neat holder. Fasten it to the back of the closet, low enough for glasses to clear shelf above.



**A rubber bumper** will soften the impact if the washing machine is pushed too hard against the laundry tub. A slit length of garden hose makes a padding thick enough to protect the washer's enamel.



**There's less cleaning up** after roller painting if the tray is lined with metal foil. Fold the liner tightly into corners and over edges. When painting job is done, just roll up foil and discard.





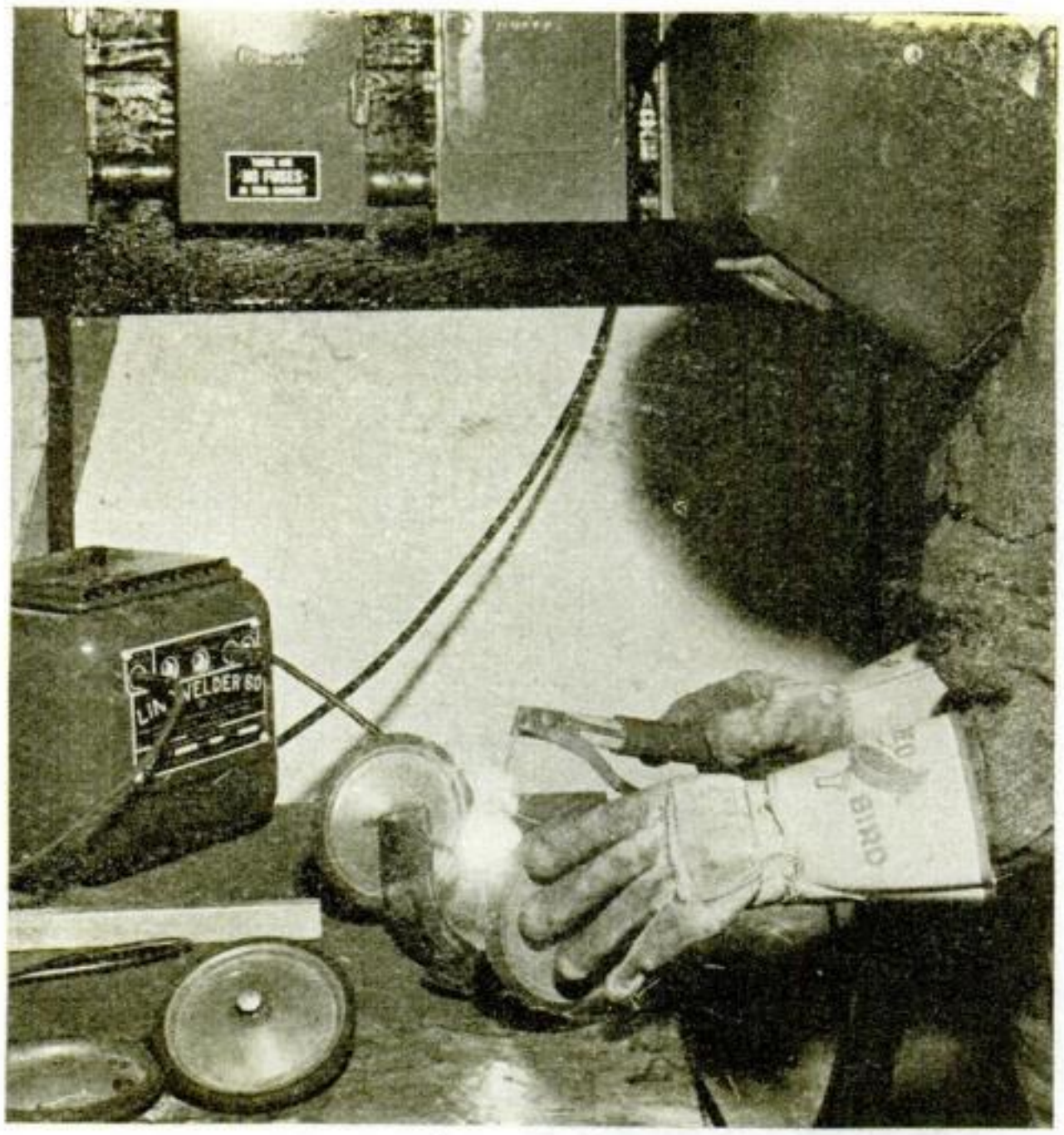
**Crib shakers** won't make the crib creep across the room and damage the floor surface if sponge-rubber squares or powder puffs are slipped under each of the legs of the bed.

**Need storage racks** for lumber? If you have a couple of sections of ladder that you never use, you have all the framework you need. Just secure them to the cellar ceiling joists as shown.



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# How I

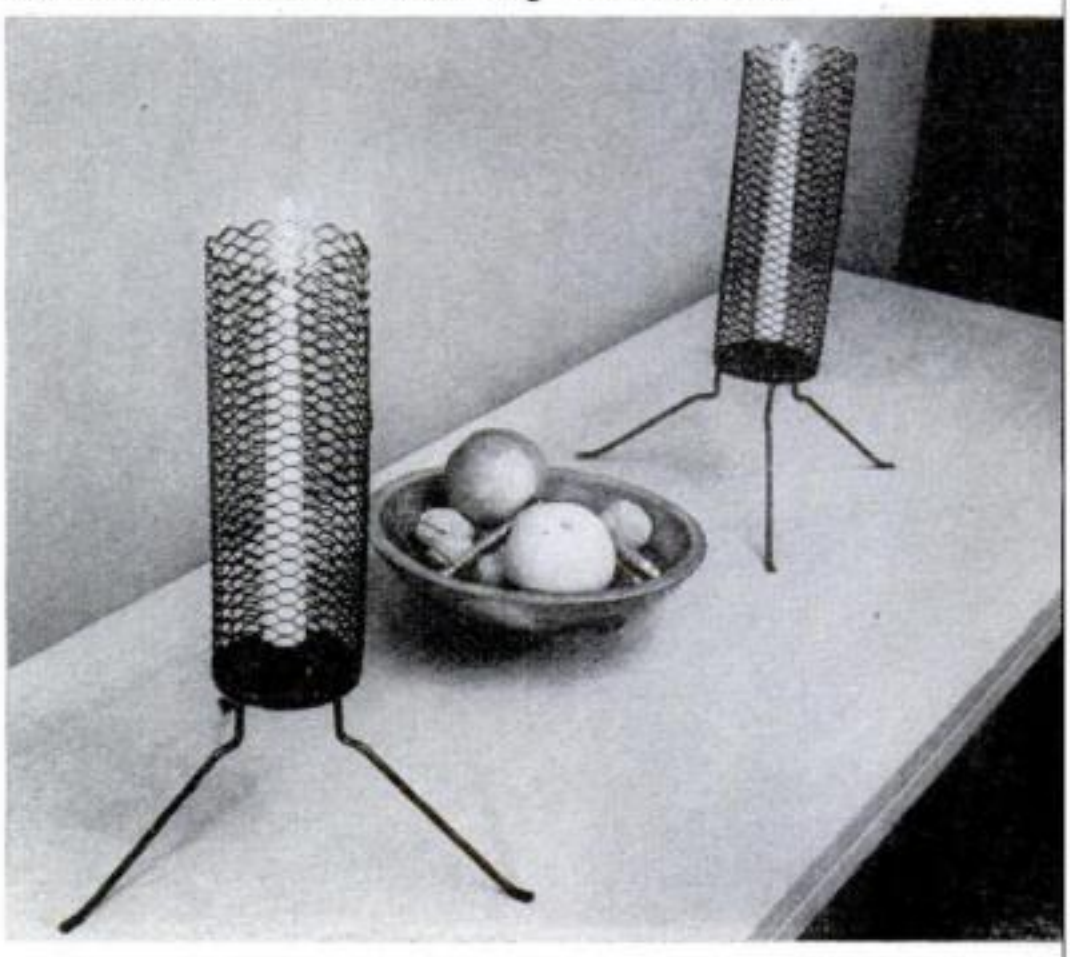


**SMALL HOME WELDER** can be plugged into any 20-ampere, 115-volt appliance line. It has four current taps, plus low-voltage circuits for electrical testing, battery charging, and soldering. Either 1/16″ or 5/64″ welding rods can be used, as well as a carbon-arc torch, which gives an intense flame for brazing. The tile table and candlesticks below were made with this welder. Repairing toys and garden tools is one way such a machine helps pay for itself.



**COLORFUL TILE TOP** finishes off this table. A frame of ½″ by ½″ angle iron was made by notching, bending and welding the joints. Self-bracing "hairpin" legs of ¼″ steel curtain rod were welded across the corners.

**WHO'D GUESS** these airy modern candle shields are made of metal plaster lath? Legs of 3/16″ rod were welded to candle sockets of conduit. Shields rest on paint-can lids.

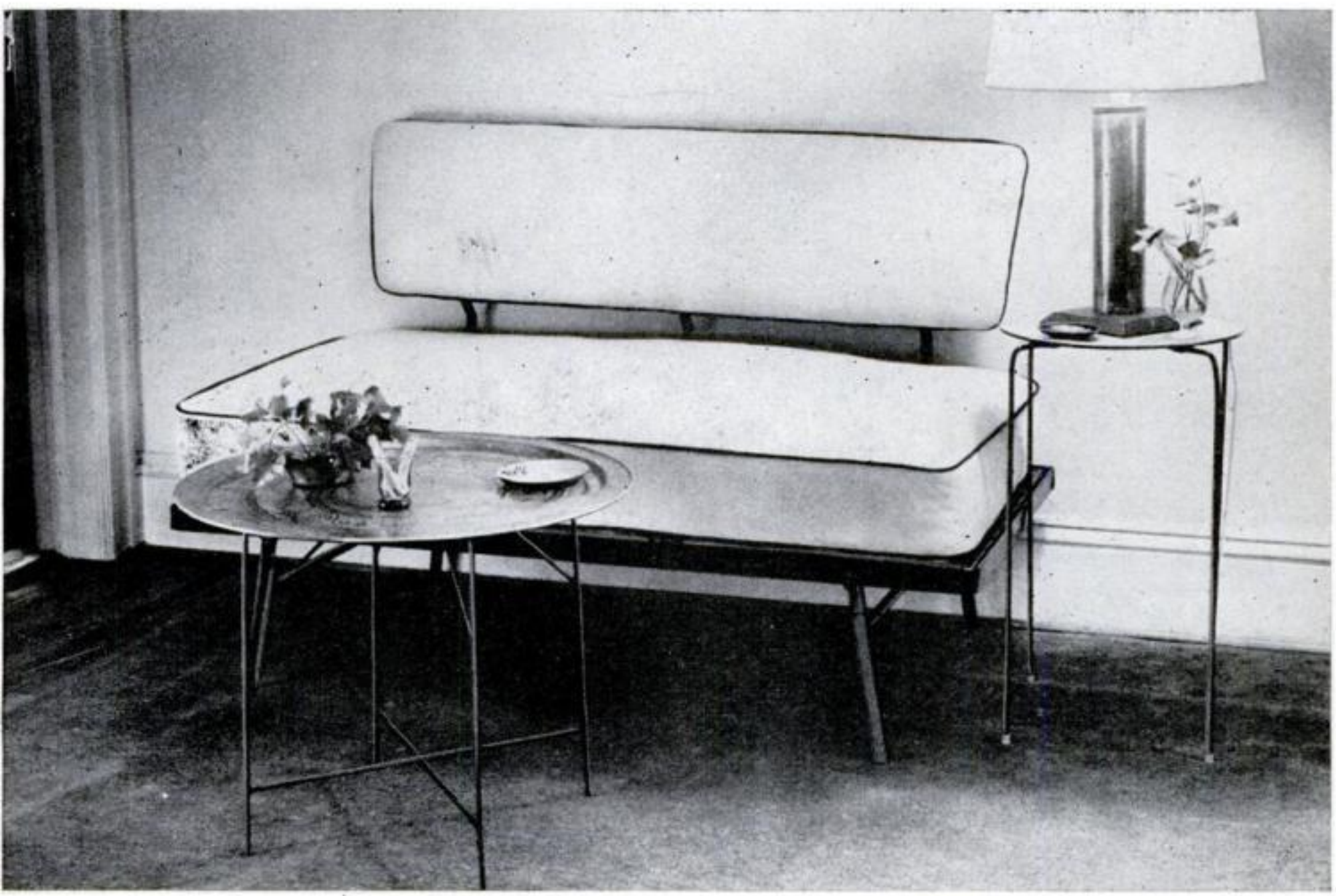




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# Learned Arc Welding

***Metal flows like butter, joints become as strong as steel, when you have made this metalworking technique your own.***



**MODERN COUCH has a frame of 1½" angle stock, welded with ⅛" electrode at 100 amperes from the large welder shown on page 207. Legs and rungs are thin-wall conduit, welded with 1/16" rod and light current. Spring and mattress are from a child's crib. Backrest, a table leaf upholstered with foam rubber, is mounted on supports of ¾" angle.**

**By Harry Walton**

ARC welding, like cutting glass, is 90 percent self confidence and 10 percent skill. The first time I tried to weld, I decided it just wasn't in my line. Practice changed my mind, and now I'm pretty cocky about it.

Almost before my wife can decide she wants a new tile-top table, I'm hacksawing stock for it. Welding makes most jobs so much easier that I can finish them while they're still fun—a far cry from building things with fussily fitted joints and bolts or rivets. Hacksaw, bend and weld is the schedule for even swanky projects, like some of the furniture on these pages.

***It's cash in your hand.*** Knowing how to weld pays off. Even after deducting the cost of my outfit from the value of things I've built and salvaged, I come out ahead.

The kids' slide in our back yard was welded from eight bucks' worth of conduit and sheet metal. Broken wagons, tricycles and other expensive toys have been repair-welded as good as new. A king-sized outdoor fireplace grill was welded up of steel rod. Garden tools have to wear out; break-



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**PLANT STAND has supports bent from 5/16" square iron and shelf frame of ½" by ½" angle. Welding was done with 3/32" rod at 70 amperes. If welder hasn't enough capacity to weld this thickness, parts could be brazed with a carbon-arc torch. Shelf is expanded-metal mesh, held in with tack welds.**



**TRAY LIFTS OFF for bringing in refreshments or taking dishes back to the kitchen. Frame was made of ½" by ½" angle to fit the tray, with legs of same stock welded on.**

**EMBOSSED BRASS TRAY, formerly a wall decoration, was made into a handsome coffee table by welding a stand of ¼" curtain rod.**



ing will get them nowhere. I just weld them.

Indoors we have some of that wrought-iron furniture you can blow a bankroll on. But ours came out of my basement shop, and cost me only the price of the angle iron.

If I had the time, I could do a cash business in small welding jobs for the neighborhood. There are plenty of them.

***Buying a welder.*** Farmers got wise to this welding dodge a long time ago. Like most home mechanics, I thought it was strictly for tractor hitches and other husky jobs and that the equipment was too expensive for me.

But small transformer welders start down around 40 bucks, and can be plugged into any 20-amp. (12-gauge wire) appliance line. A transformer welder has two separate windings. Line juice goes into one, and you take welding current from the other, at a lower voltage but a higher amperage. For instance, the welder I started with (shown on the first page) gives me over 50 amperes to weld with, but won't blow a 20-amp. fuse.

With a transformer welder, you are insulated from the 115-volt line. The electrode voltage is never over 65 volts, so the shock hazard isn't very great.

My own transformer rig cost me less than $50 with a helmet and a supply of rods. Another ten-spot went for a carbon-arc torch, a pair of leather gauntlets and a piece of ⅛" steel plate to weld on.

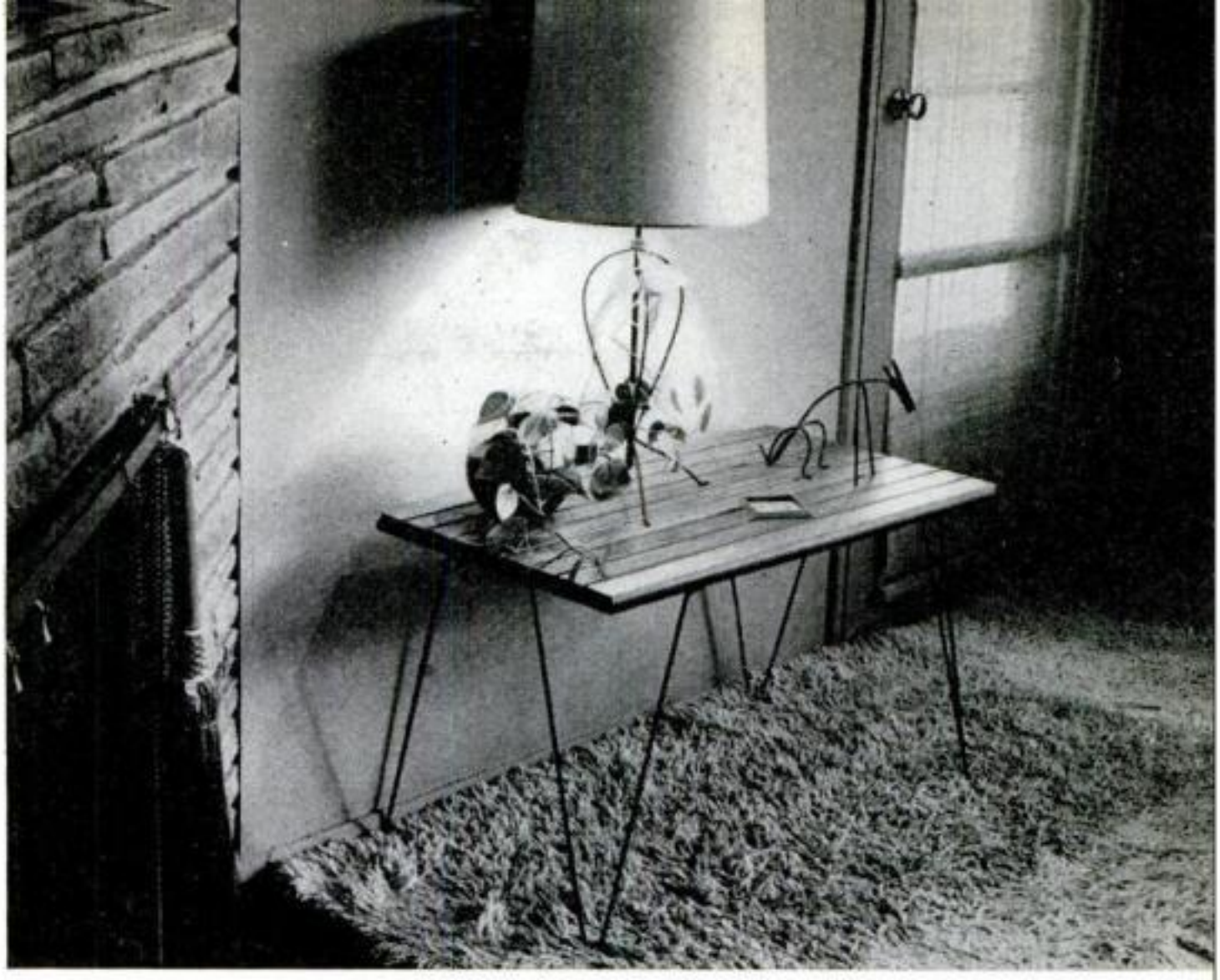
Of course there is a limit to what 50 amperes will weld. It won't build farm machinery or patch a cracked cylinder block. Sheet or strap iron ⅛" thick and rod 5/16" in diameter are about the top limit. But that's enough for most jobs around the house, and I can use the arc torch to braze heavier stuff. The iron railing on our front step was built that way.

***Striking an arc.*** I set up the frame from an old washing machine alongside the furnace, where there is nothing that sparks could set on fire, and laid the steel plate on it. I put the ground clamp on a clean corner of the plate, plugged the electrode cable into the lowest "heat," or current tap, and clamped a 1/16" rod in the holder.

When I swung the helmet down, all the lights went out. I jabbed blindly toward a piece of 1/16" sheet I had laid on the table. Things started off in a shower of sparks that made me jerk the electrode back. This comes naturally, but it won't do any welding.



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**NOTCH A LENGTH** of small angle as in the drawing below. Bend and weld to form corners, weld on legs bent from ¼" rod, and set in a top of wood slats. Result is a slick modern occasional table like this one. Angle can be bought at farm-supply and welding shops, rod at big hardware stores. Lamp is a piece of ⅛" pipe with shaped 3/16" rod welded on. Clothespin head of wire dog holds mail.

I jabbed again. There was one fat spark, the transformer hummed loudly, and the rod was "frozen"—welded to the sheet. When I yanked up on the rod, the sheet came with it. Sparks flew from every corner as it dangled on the table.

With a flying fumble, I turned the welder off. After breaking the rod free, I took a deep breath and tried again, first clamping down the practice sheet. This not only gives a better ground, making it easier to strike the arc, but it lets you break a frozen electrode free readily. If it won't break free, you simply release it from the holder.

This time, when the rod froze, I raised the mask to see better for opening the holder clamp—and looked a juicy arc right in the eye as the rod came out. Rule one: never raise the mask to free an electrode.

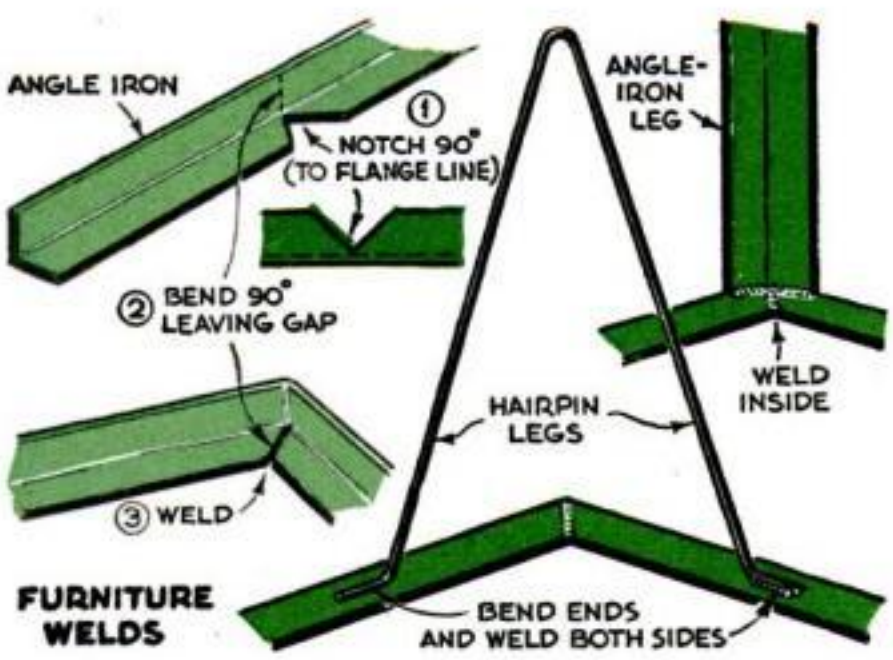
Arc flash isn't dangerous, but it won't help you enjoy life. Always wear a proper arc-welding mask—not gas welder's goggles or sunglasses. Veto anybody else's watching you "for just a few seconds" without eye protection, and don't let the family pup into the cellar while you're welding.

It's impossible to see through the helmet until the arc is struck. If you can practice in sunlight (even if it comes through a cellar window) you may find it easier to get started.

About this time I decided to look at the directions. Strike an arc, they said, by scratching the rod on the work like a big match. But pull it off about ⅛" as soon as the arc forms, because molten metal flows across first, and this is what freezes the electrode. After a second or two, lower the tip of the rod to correct arc length. With my welder this is 1/16" to ⅛" (about the same as the rod diameter).

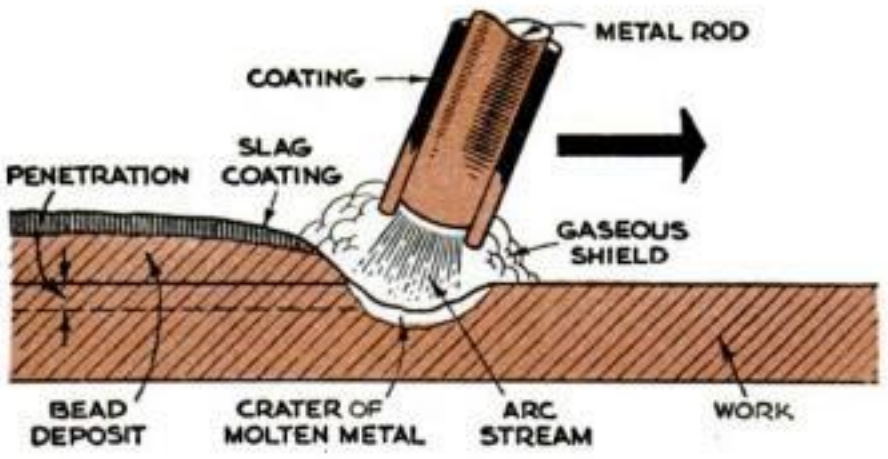
Doggedly determined to weld, I tried again. Sparks flew—and somebody lit a hot foot inside my right shoe. After a short Fred Astaire step, I formulated rule two: make sure your work pants are long enough to cover your shoe tops, or wear high shoes if you have them. Every time I break this rule I wind up with a hot instep, a hard thing to get used to.

***Start in high.*** Up to now I hadn't seen an arc for more than a second or two. So I went all out by shifting to the high current tap (about 55 amperes on that machine). I know now that it's easier to hold






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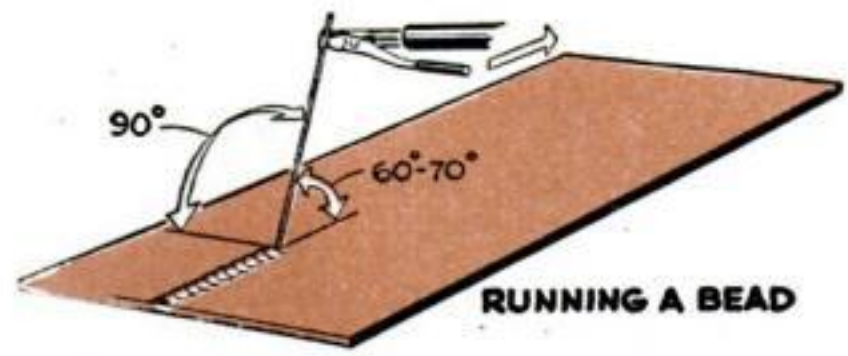

an arc with bigger rod and more current. On big welders, students usually start off with 100 amperes.

Now I could hold the arc long enough to see what goes on. A puddle of molten metal forms under it, and metal from the rod is blown into this by the jet action of the arc. The trick is to melt in metal from the rod well below the surface of the work (that's called penetration). You have to move the rod along just slowly enough to lay down a uniform deposit of weld metal, or bead, while melting the work to receive it. As the rod keeps melting away, you also have to move it down gradually to maintain the correct arc length.

All this with one hand. Don't try to steady the electrode holder with the other hand if you want to learn right.

Speed of travel and arc length are both critical. Too short an arc will tend to freeze the rod. Too long an arc makes an irregular bead, with lots of spatter alongside it and poor penetration. The sound of the arc is a tip-off: a good one has a sputtering, sizzling sound like bacon frying. Too long an arc has more sputter but less sizzle to it.

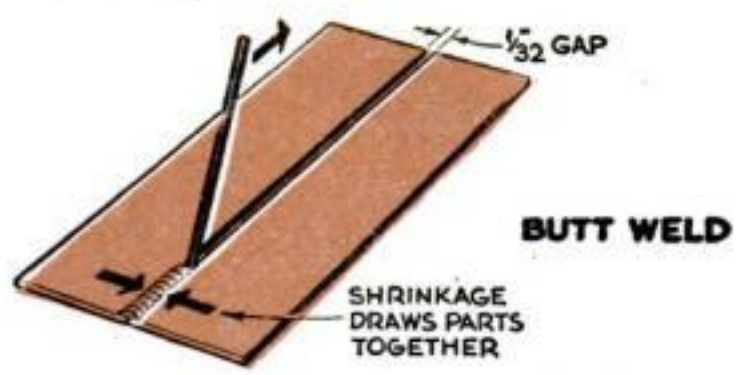
***Laying a bead.*** Running beads on a flat plate is the first thing to practice after you can hold an arc. Keep the rod upright (as seen from the line of travel) but slanted




about 25° to the right, the way you're moving it. Move the rod slowly but steadily. A good bead is rounded on top, uniform in width, and blends into the work on both sides. It shouldn't show an overlap of unfused metal along the sides, nor be wide here and thin there.

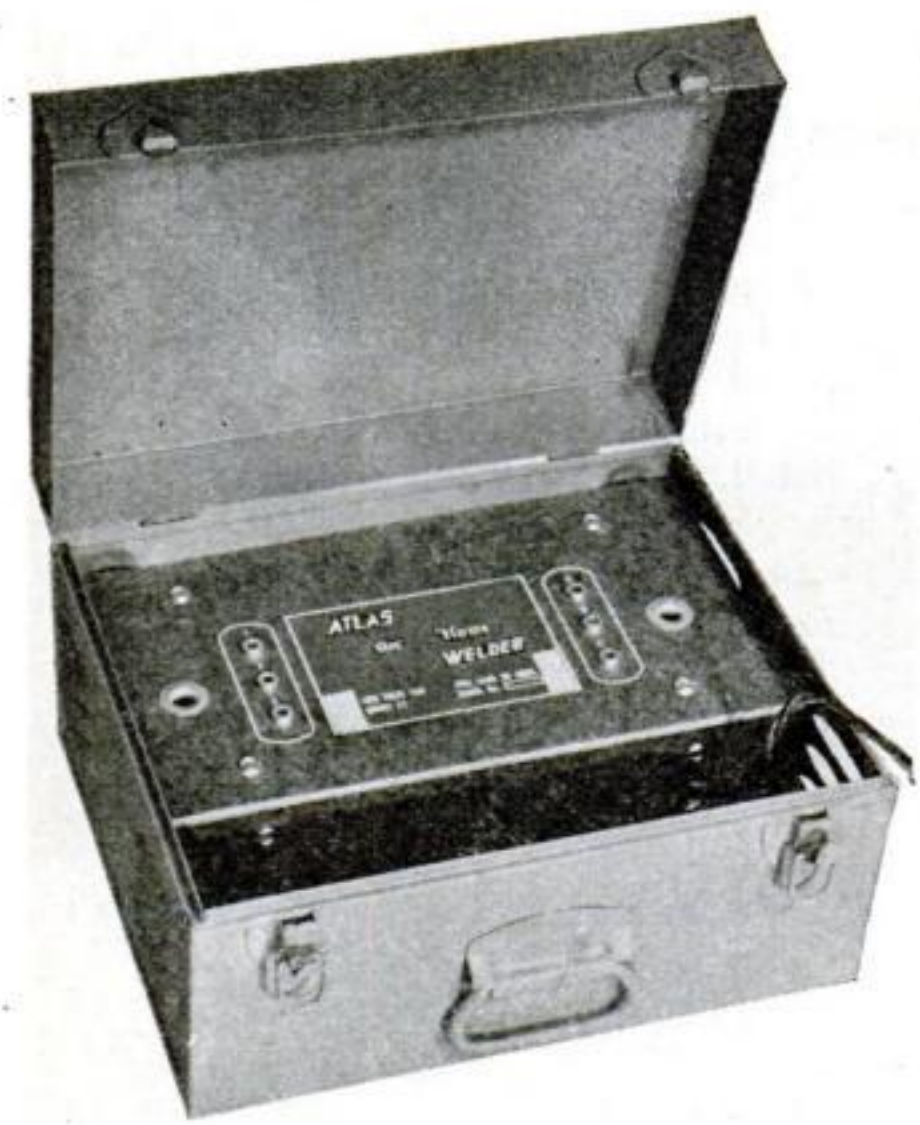
Mine did. and were: I wasn't holding the arc length steady, and my rate of travel was something like a kid's through a street carnival on his way to the circus. Comparing my beads with the pictures in the instructions, I decided to be nonchalant and light a cigarette.

After a few drags, I switched on the machine and flipped the helmet down. The cigarette bent double and burned my chin. Grabbing for the helmet, I let the electrode drop. Sparks flew from the table, over the mask and past my ear.




Nursing my chin, I formulated rule three, which has something to do with smoking while you weld.

***Beads and butt welds.*** With the right current for the job, electrode travel should be slow. I found most of my bad beads were




**ROOM FOR RODS, arc torch and electrode holder is provided in steel case of this 75-amp. model. Made for use on 115 volts, it draws under 30 amperes at full load, can use ⅛" rod and weld ¼" plate in a pinch. Nine welding heats, plus low currents for soldering and silver soldering, are available. It's priced under $50 with helmet and arc torch.**



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made by moving too fast. You should lay ½″ to 1″ of bead for every inch of rod used.

Having run a bead, you shut off the juice and chip off the slag on top of it with a scraper, a sharp-edged hammer or a wire brush. You can't see what the bead is like until the slag is off. It's hot, so brush or chip it *away* from you, and watch your eyes!

When my beads began to look like the pictures, I decided to weld something together. Butt welds looked easy. I clamped two pieces of ⅛″ plate close together with the edges touching, and ran a bead where they met.

After knocking off the slag, I picked the pieces up with pliers, intending to test the joint in a vise. It beat me to the punch by falling apart before it got there. The reason: no penetration.

Anybody who can hold an arc can deposit weld metal, but unless it fuses with the work, it isn't welding. Clamping the edges close together was a mistake. With 55 amperes, butt joints in anything heavier than light sheet metal should be set up with a gap of about 1/32″ between the edges. This lets the arc get into the joint. If leaving a gap is impractical, the two edges should be filed or ground to a bevel, which has the same effect.

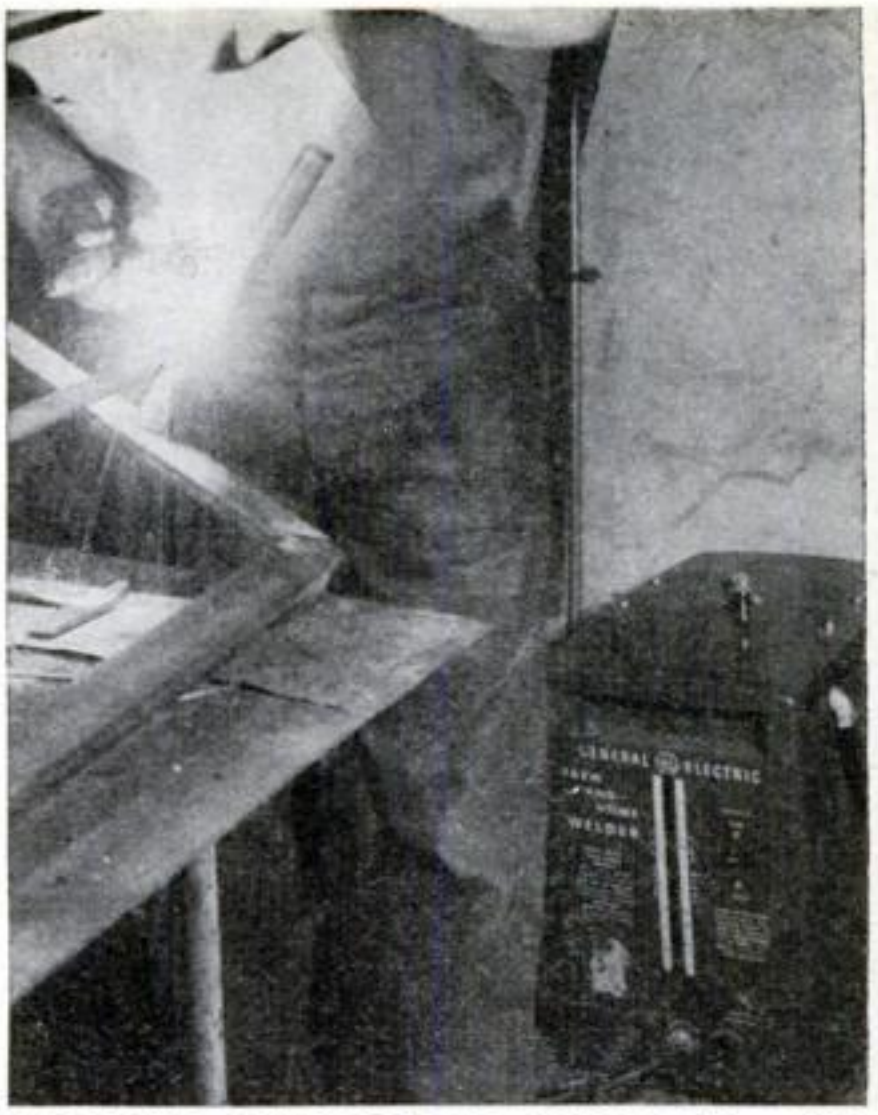
A flat butt weld is made just like a bead, but the electrode is tilted a bit more (about 30°) in the direction of travel. A thin line of weld metal appearing on the other side of the joint indicates good penetration. If you want maximum strength, run a second bead on that side.

If you measured across a butt joint before welding, you might find it smaller afterward. That's the effect of shrinkage. The weld metal, deposited hot, is sure to shrink on cooling. This tends to draw the parts together across the bead.

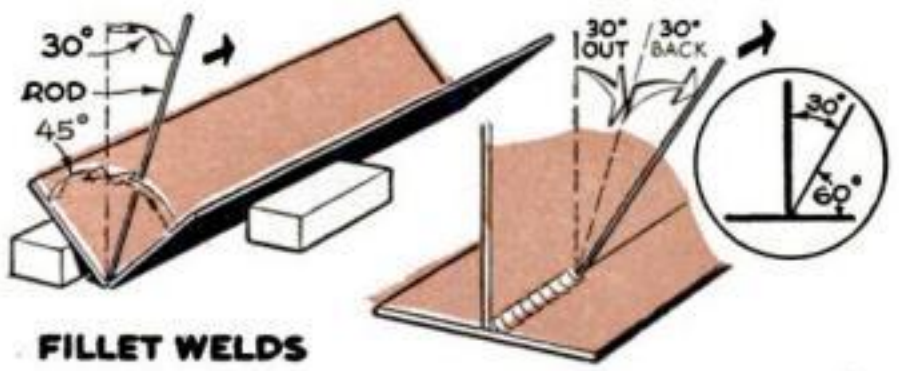
Two pieces welded together at right angles will be drawn out of alignment on the side of the bead. One way to neutralize this is to lay a second bead on the other side and let the two fight it out.

***Lap, fillet and corner welds.*** For a lap weld, point the electrode into the corner at an angle of about 60°. A slow oscillation of the rod across the bead (called weaving) helps get adequate penetration on heavy stock. It's also useful when one piece is much lighter than the other. Time it to dwell on the heavier stock *and to touch the lighter one only an instant at a time.*

An inside weld on two members at right



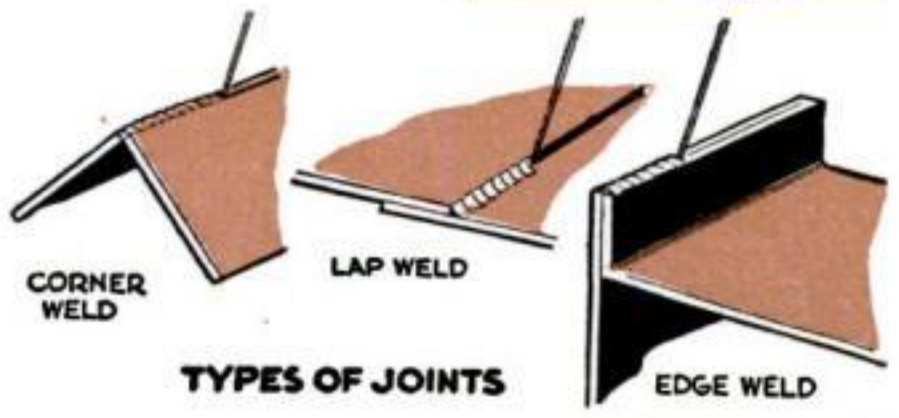
**MAN-SIZED TRANSFORMER WELDER like this 180-amp. unit will handle ½″ plate and similar heavy work. Only half the capacity of this one was needed to weld corner joints in ¼″ by 1½″ by 1½″ angle for the modern couch shown earlier. It has a rotary control on top for varying the current, here adjusted to 35 amps. for using 1/16″ rod to weld conduit rungs to the legs. If you have 230-volt juice, installation of an extra fuse box and new outlet may enable you to use such a machine. With it, you can weld almost any job.**




**FILLET WELDS**

angles to each other is called a fillet weld. If possible block up the two parts to form a V on the table, so that you can lay a flat bead inside the corner. This is easier than welding with one piece flat and the other upright, for which you have to hold the electrode at about 60° to the flat member.

[*Continued on page 242*]




**TYPES OF JOINTS**

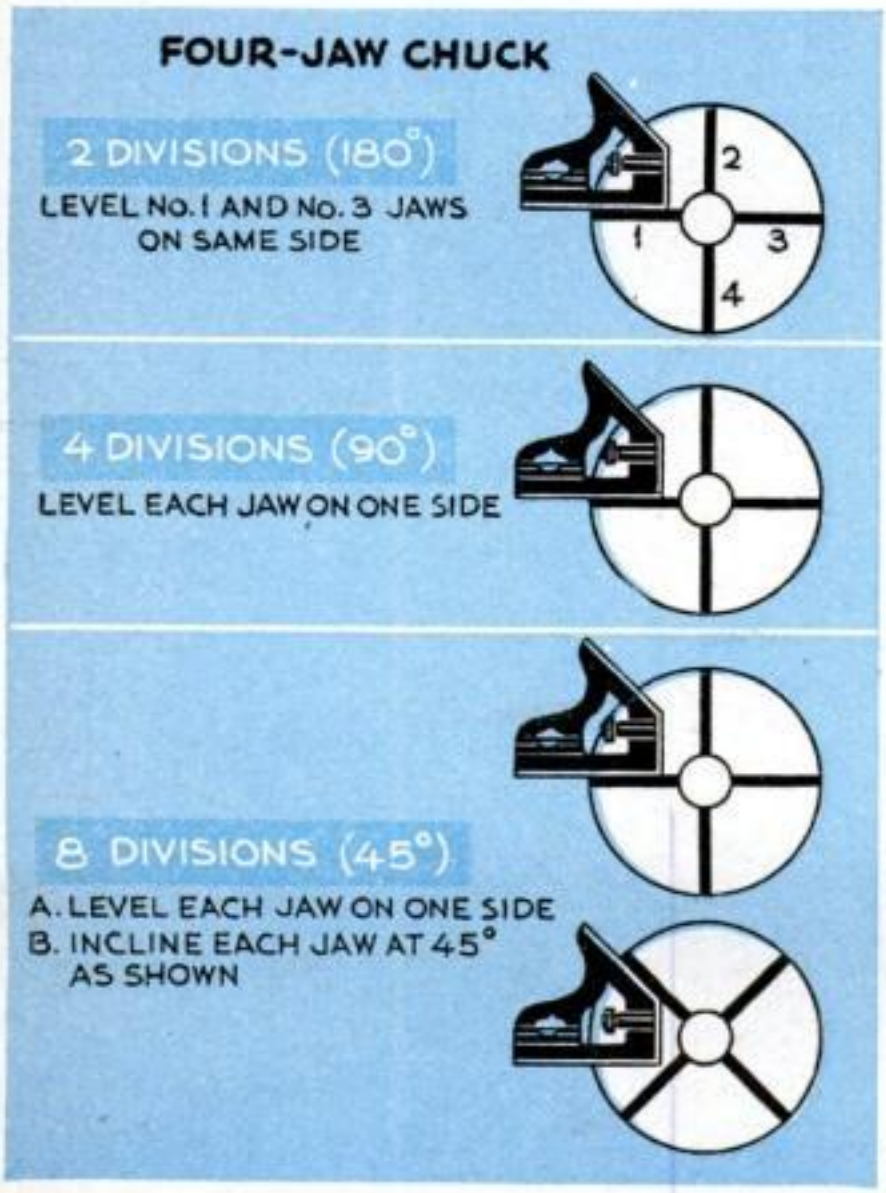


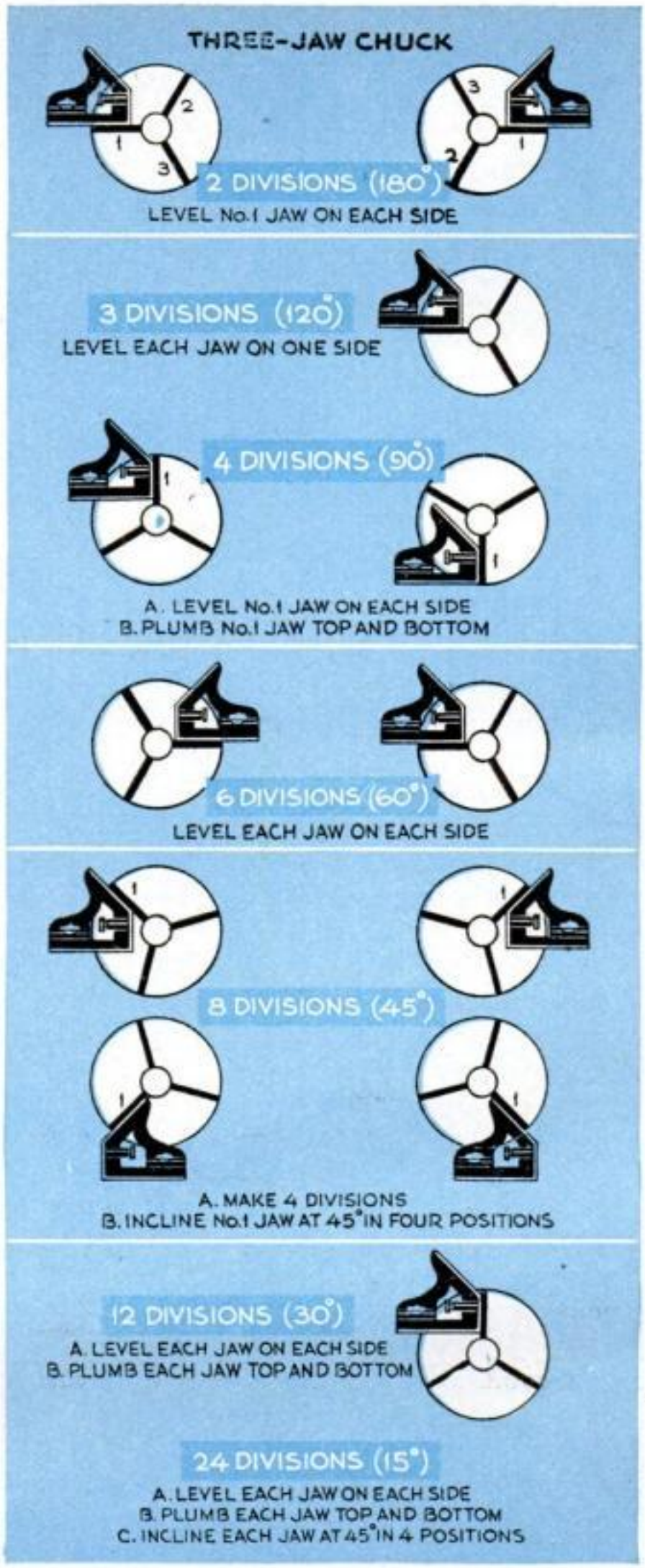
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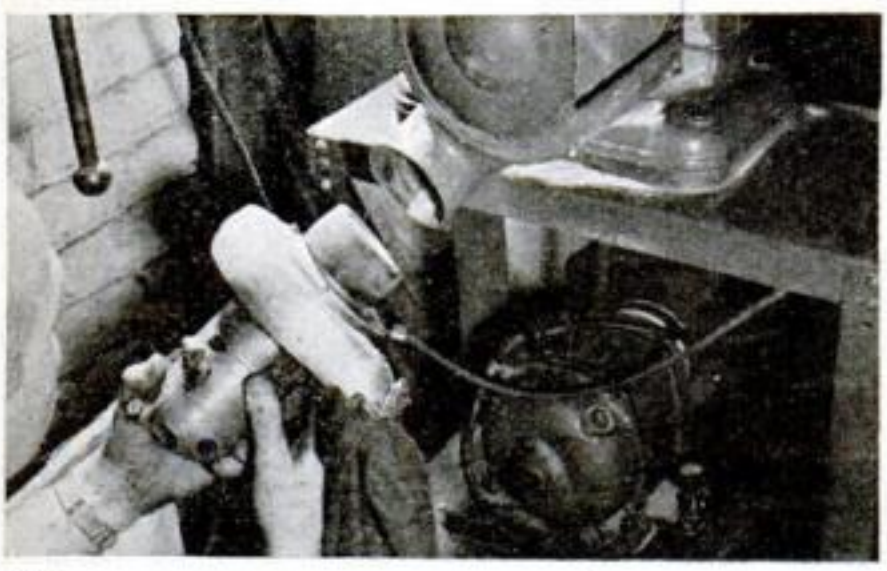
## New Shop Ideas

**Indexing by Level.** If your lathe lacks an indexing rig, this dodge is handy for rough dividing jobs. Use a toolmaker's square with a built-in level and hold it against a chuck jaw, turning the chuck until the bubble is centered precisely. Then scribe the work with a tool mounted at exactly center height. The drawings at right and below show various combinations with both three- and four-jaw chucks, for divisions ranging down to 15°.

Though less accurate than an indexing head, or even a gear chucked along with the work, this system is still a lot better than stepping off divisions with machinist's dividers.—*Malcolm I. Hill, Southern Pines, N.C.*



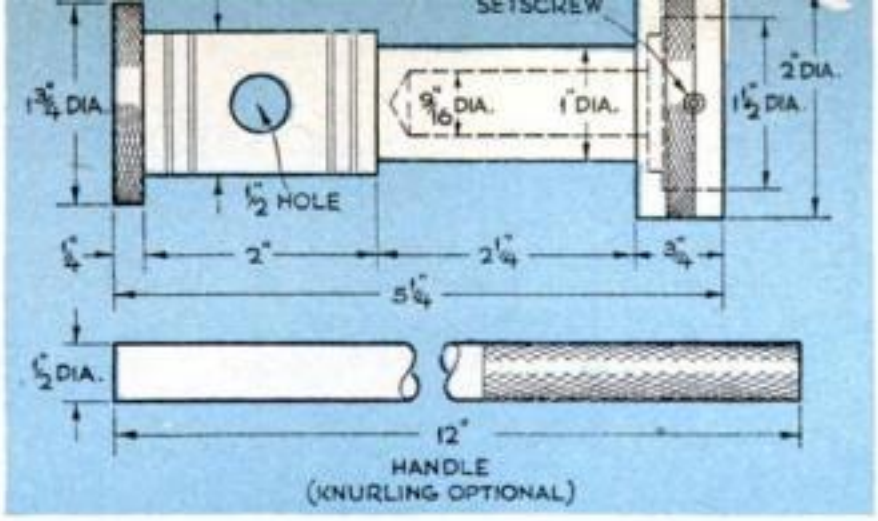



**Vacuum on Sander Keeps Shop Neat.** Attach an old vacuum-cleaner motor to your sanding machine to eliminate that fine layer of dust that settles over the entire workshop when power sanding is done.

Couple it to the sander opening with a short length of rubber tubing of suitable diameter. Use the old cleaner bag or wire a cotton bag to the exhaust opening as shown. Wire the motor to the sander switch so that it will start up when the sander does.



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**Extension Die Stock.** The handle of this elongated die stock is well above the die rather than on a plane with it, as with standard die stocks. This makes it possible to thread parts—such as U bolts or multiple studs—that have little clearance.

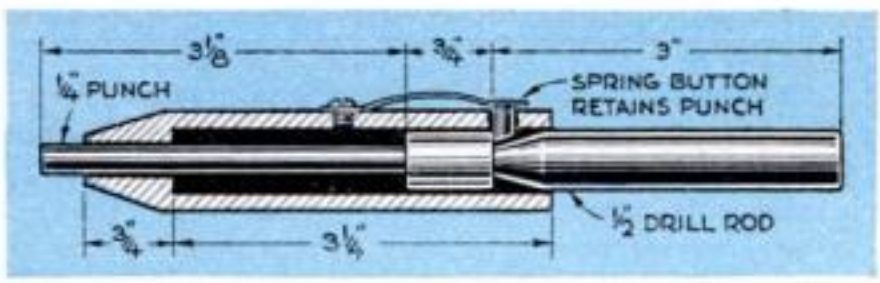
Turn the body from a length of 2″ cold-rolled steel and drill a 9/16″ hole halfway through its length for cutting long threads. Bore the head to take a ½″ die. Use a 12″ length of ½″ steel rod for a T handle.—*W. B. Goodrich, Somerville, Mass.*

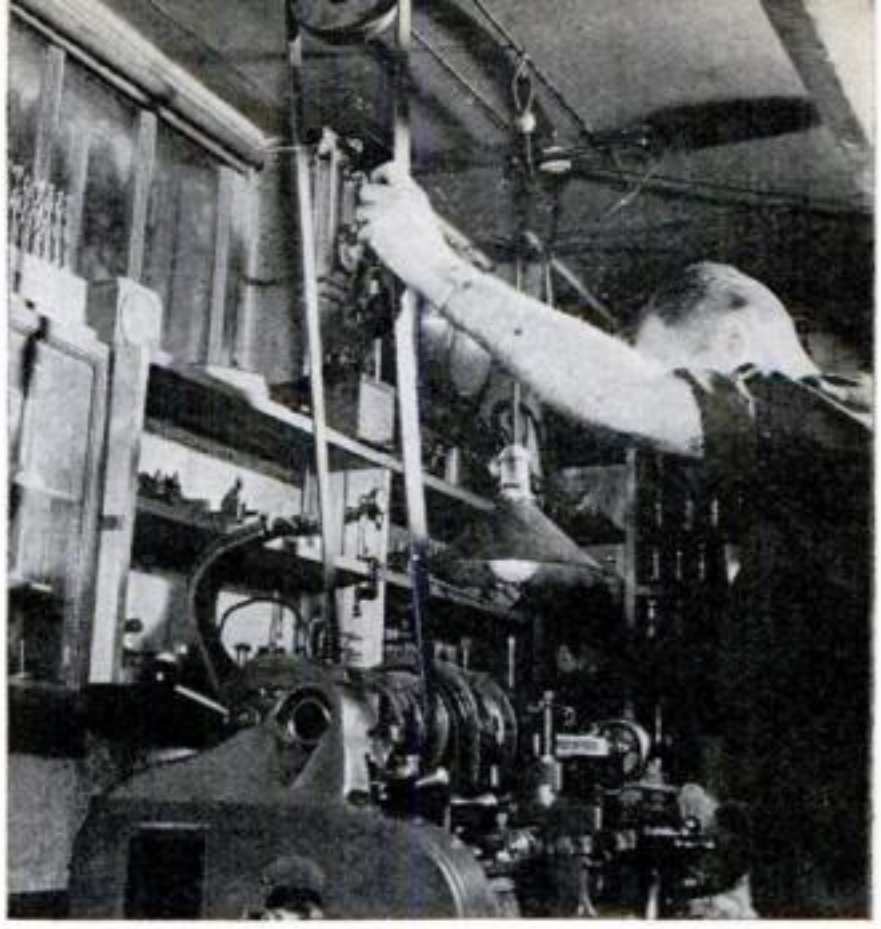
**Drilling Casehardened Steel.** A hand drill or power drill can be used to drill casehardened steel as readily as cold-rolled steel. The trick is to grind off the hard skin at the spot you wish to drill, and then drive in a deep punch mark.

When drilling *through* a casehardened piece, it is wise to grind off the skin on the underside as well, although the drill would probably break through anyway.—*John Krill, North Lima, Ohio.*

**Sheathed Punch is Bend-proof.** A long, slender punch often bends when you start it against a pin that must be driven through a shaft of large diameter.

This punch features a sheath that supports the slender stem during the first critical inch or so of driving. The sheath retracts as the punch follows the pin through the hole. As the pin is driven out, the hole supports the punch emerging from its sheath.

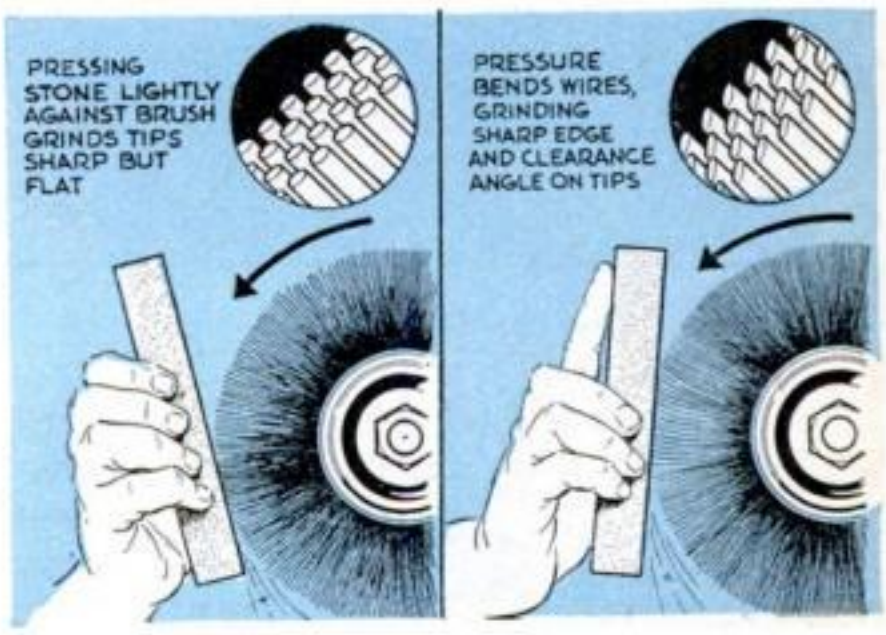


**Idler Belt Turns Lathe Over by Hand.** The idler belt shown above does not power the lathe. Its purpose is to provide an easy way of rotating the spindle by hand to cut those last few critical threads on a lathe threading job.

The belt runs idly on the upper pulley while threading is done under power in the usual way. As the tool nears the end of the cut, power is shut off and the spindle is turned by pulling down on the belt.

A pin-linked belt fastener permits quick removal of the belt for regular turning operations.—*F. McGuckin, Ridgewood, N. J.*

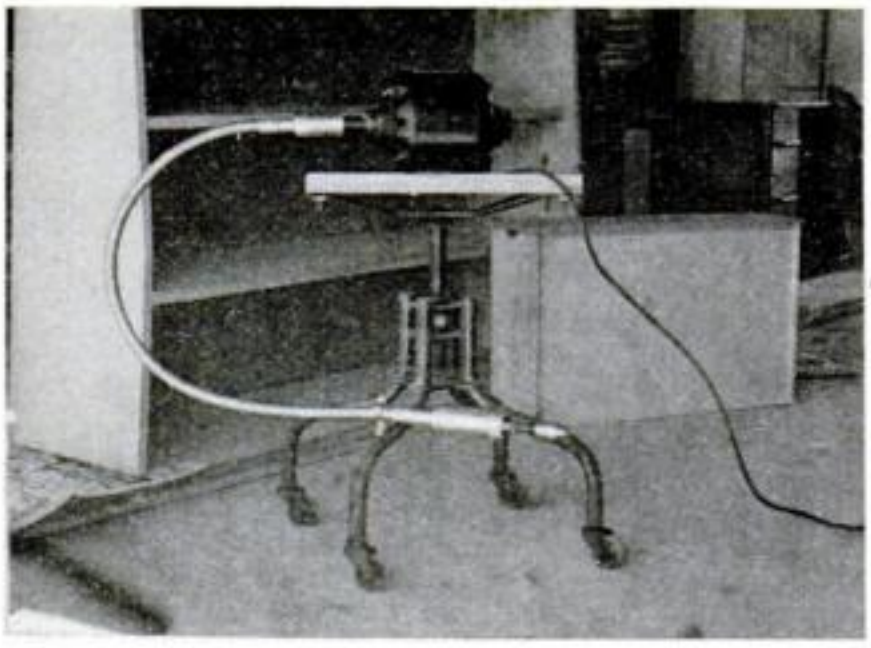



**Sharpening a Rotary Wire Brush.** After a period of hard use my wire brush seemed to lose its capacity for cutting. Rotating the brush at 3,450 r.p.m. against a coarse carborundum stone as shown at left above squared off the wires. Then heavy pressure was used to grind clearance. Finally, the brush was reversed on its arbor to bring the sharp edge of the wires into the work. Then it cut better than a new brush.—*A. B. Walrath, Albany, N. Y.*



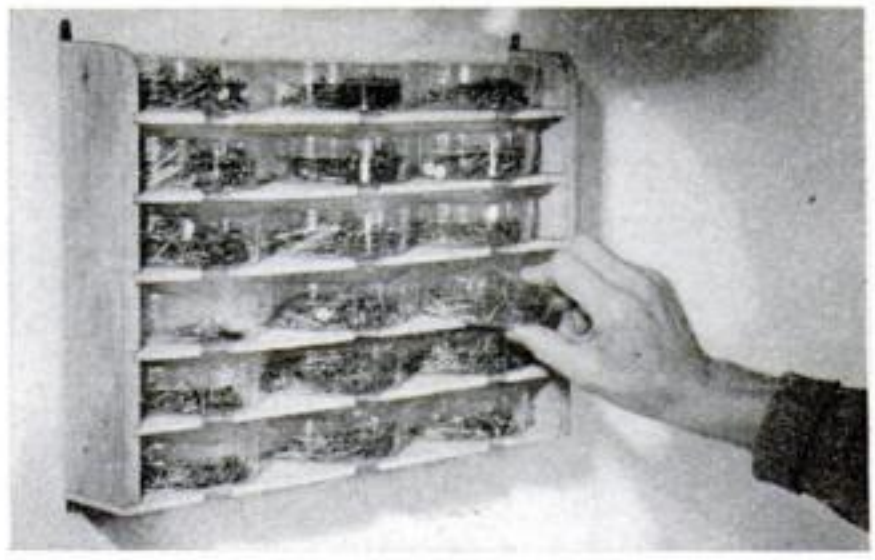
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## Flexible Shaft Rolls to Work



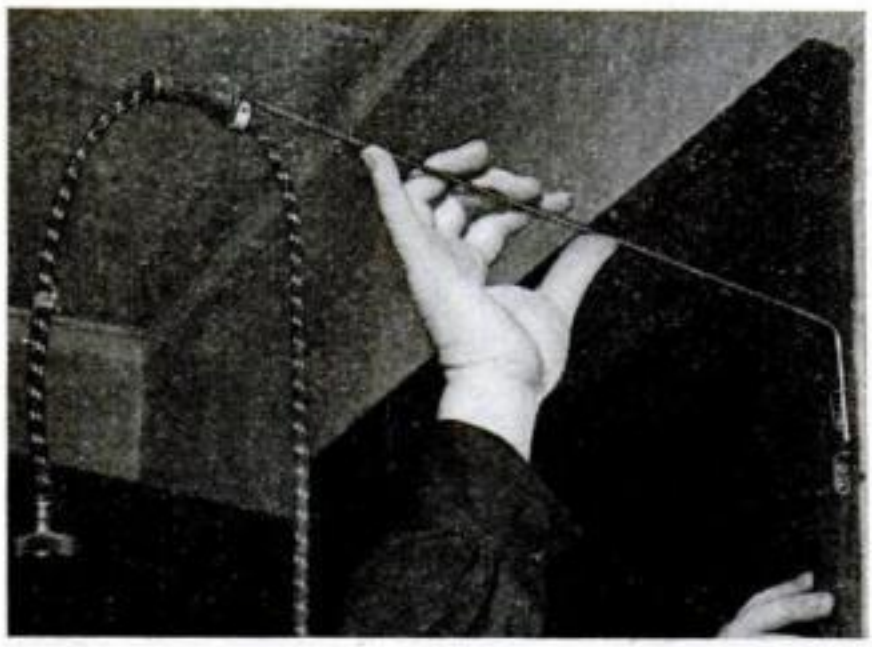
A ROLLING base for a flexible shaft and motor can be made from an old swivel chair. Unbolt the chair seat and replace it with a board or a piece of ¾" plywood. Add a tool clip to a leg of the chair to hold the chuck end of the shaft when not in use—*Chester R. Baggs, Sacramento, Calif.*

## Cheese Boxes Hold Small Parts



SCRAP wood and half-cylinder plastic boxes can be combined to make a cabinet for nails, screws, bolts, nuts, washers and other small parts. The boxes are the kind in which some packaged cheeses are displayed. Ask your grocer to save them for you. Cut semicircular notches in the shelves so you can withdraw the boxes easily.—*Bertram Brownold, Cedarhurst, N. Y.*

## Bracket Supports Ironing Cord



THE cord to the electric iron will stay out of your wife's way with a simple bracket like this one. Bend a length of light curtain rod so the short leg will slip through two metal angles mounted on the wall. A spring soldered to the end of the rod will permit the cord to slip through without kinking.



For greater flexibility, you can make the cord on the bracket an extension line into which the iron cord is plugged.—*Carlton G. Bucher, White Plains, N. Y.*

## What Would You Do?



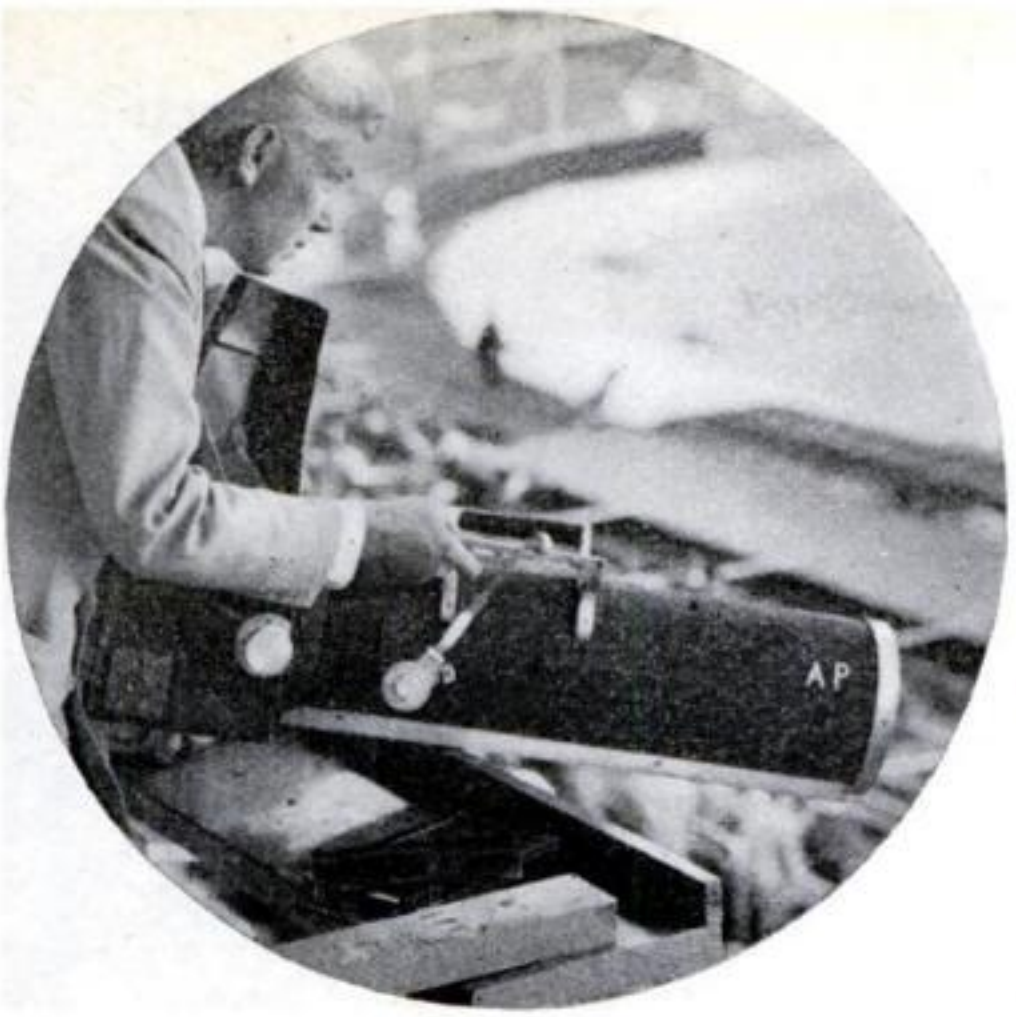
The scenery was superb and the sky gorgeous with fleecy clouds—a perfect combination for fine vacation pictures. In no time I had exposed all the cut film in my dozen plate holders. There were many more photos I wanted but we were miles from a darkroom where I could reload.

Over my wife's protests, I emptied the car trunk and doubled up inside it. While she stood outside anxiously asking "Are you all right? Can you breathe in there?" I wrapped the exposed film and reloaded the holders. A little stiffer in the joints I got the rest of my pictures.—*C. A. Veburg, Omaha.*

**Have you pulled off a smart one lately? PSM will pay for acceptable contributions showing ingenious solutions of problems in the home, shop, garage or camp. It doesn't matter if it's wacky—if it works. Use government postcards only. Contributions cannot be acknowledged or returned.**



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# How They'll Photograph the Series

**By John S. Bodkin**
*Associated Press Photo Editor*

***Big Berthas and K-25s aren't meant for snapshooting, but at a ball game they catch every bit of the action.***

WHO will win the World Series next month still is any man's guess. But you can be sure of this: when the first ball is tossed in the opening game, news photographers will catch it on film, and through all the succeeding games their cameras will click a steady accompaniment to every important play.

Photographing America's top sports event takes weeks of preparation. Even now, photo editors in the New York office of the Associated Press are planning how to get and han-



**TELESCOPIC VIEW** of opening pitch in third game of 1951 Series at Polo Grounds was shot by Harry Harris with 60" lens from center-field stands 400' from home plate. Note how lens foreshortens 60½' span between mound and plate. Pitcher Hearn follows through as inside pitch, headed for Westrum's mitt, makes Woodling lean away.



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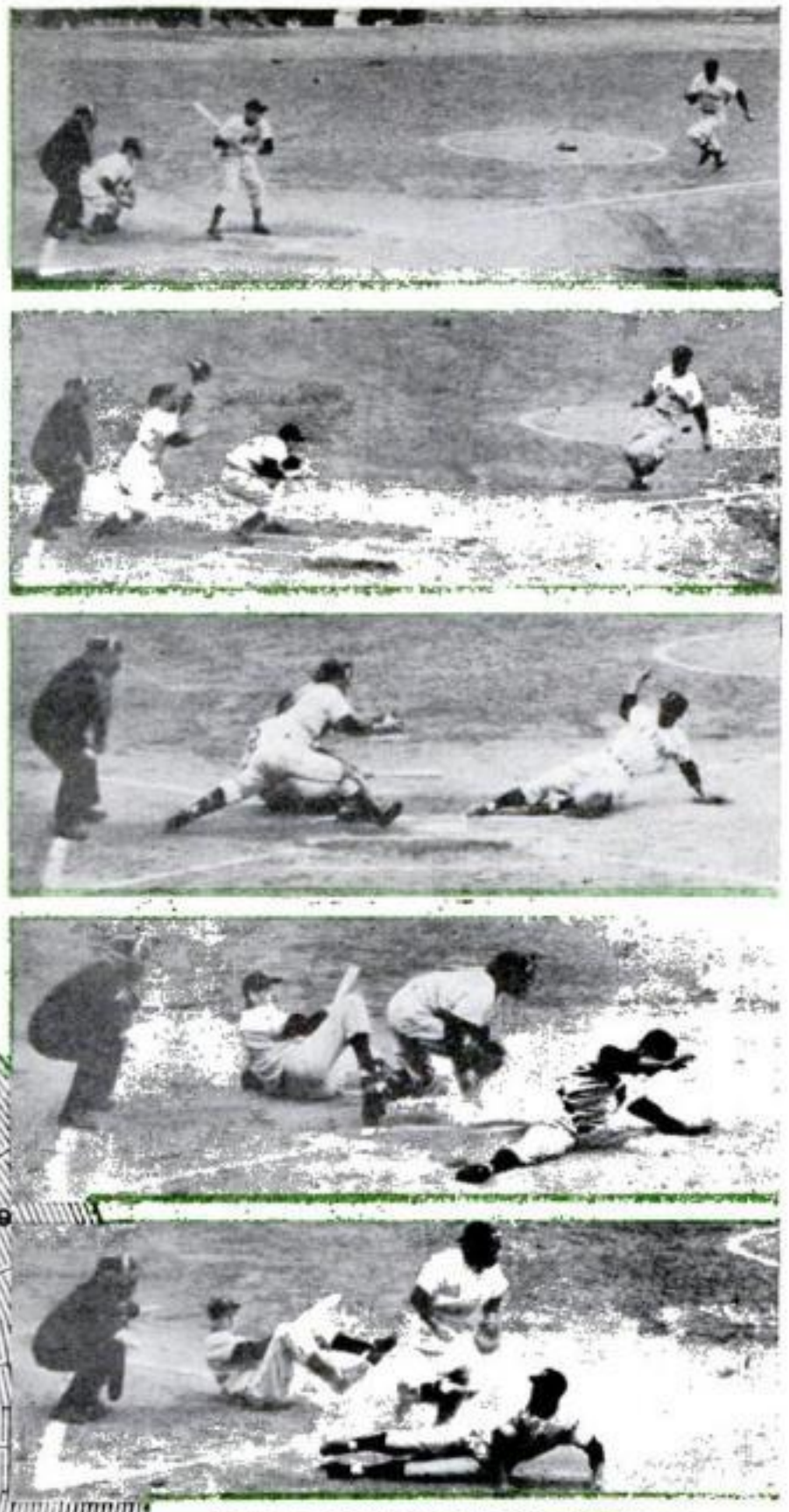
**FROM LEFT FIELD** Harry Harris peered into hood of giant 60" camera and got scene above.

**FIRST TO STEAL HOME** in a World Series game was Giant outfielder Monte Irvin in first inning of opening game with Yankees last October 4. Four AP cameras, trained on the field from different angles, caught as many views of the historic play. The map of Yankee Stadium shows where each cameraman stood.

**FROM THIRD-BASE SIDE** Jack Harris tripped 36" Big Bertha for this view of Irvin's slide.



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**SERIES OF PHOTOS** that Murray Becker made with sequence camera shows steal from beginning to end. Fourth shot was sent to newspapers as separate photo.



**FROM FIRST-BASE SIDE** John Rooney used another 36″ Bertha for crucial moment of steal.



**SEQUENCE CAMERA** like the K-25 operated above by John Lindsay was used by Becker to catch the steal shown at left. This camera makes three exposures per second.

dle the action photos you will see in the newspapers.

By snapshooting standards, the cameras the photographers will use are very impressive affairs. Big Berthas, aimed at the playing field from high in the stands, will bring the action up close. Sequence cameras will portray hot plays step by step.

***Big Berthas*** are 5″ by 7″ Graflex cameras—which have swinging mirrors to let you look through their taking lenses up to the moment of actual exposure—fitted with telescopic lenses. Ranging in focal length from 28″ up to the AP's 60″ unit, these telephoto lenses produce a large image of action far out on the field. Big Berthas usually are shot from low level in the photographer's box with the base resting on the box sill.

***The sequence cameras*** used by most news photographers are the K-24 and K-25, adaptations of the aerial cameras developed during the war. Both use roll film and are driven by electric motors. When the photographer presses a button, the camera starts shooting, moving the film and working the shutter automatically to make three exposures per second.

The K-25 usually is hand-held. With a lens of medium to short length, it takes in a fairly large area of the playing field on 4″ by 5″ film. The K-24 is actually a back attached to a 5″ by 7″, usually a Big Bertha.

In recent years three photo editors have headed the AP's World Series lineup—Tony Bemben, Bob Tieken and Pat McDonald. Tony and Pat customarily work in the space



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**DOUBLE PLAY.** Plans for photo coverage of a game usually include a Speed Graphic with a lens that will show both first and second bases on one negative. Camera is set on clamp stand on first-base side. When a close double play occurs, photographer merely has to trip the shutter. Here, Yankee first baseman Joe Collins reaches for throw from shortstop Phil Rizzuto to complete double play in second inning of Series opener at Yankee Stadium last October 4. Eddy Stanky, Giant second baseman who bounced into the twin killing, races to first as pitcher Dave Koslo is forced at second. Photographer John Rooney made the picture.

at the park where a portable Wirephoto transmitter is waiting to rush action photos to the newspapers. Bob handles the big job of editing sequence material.

Basic camera assignments call for Harry Harris and John Rooney to man Big Berthas, one from the first-base side, one from the third-base side. John Lindsay and Murray Becker usually operate sequence cameras, also from opposite sides of the field. Two other Big Berthas are strategically placed in the stands.

Other photographers are assigned to roving jobs. Before the game they pick up miscellaneous shots. During the game, one of these men works with a Graphic equipped with a wide-angle lens, making general views that become diagrams of key plays.

Waiting messengers hurry away with film holders and caption notes. Fast development in the ball-park darkroom prepares selected prints for Wirephoto transmission, and in minutes, the pictures are on their way—so that you can see some of the day's baseball action at the same time you read about it. END

**CONFUSION reigned at home plate in the final game of 1939 Series between Yanks and Reds at Cincinnati, when John Lindsay shot this scene. Three runs scored after Ernie Lombardi, Reds catcher, was knocked down and dazed. On Joe DiMaggio's single, Frank Crosetti (No. 1) and Charley Keller scored. As the injured Lombardi remained down with Bill Werber trying to help him, DiMaggio —beyond Bill Dickey (No. 8)—also scored.**

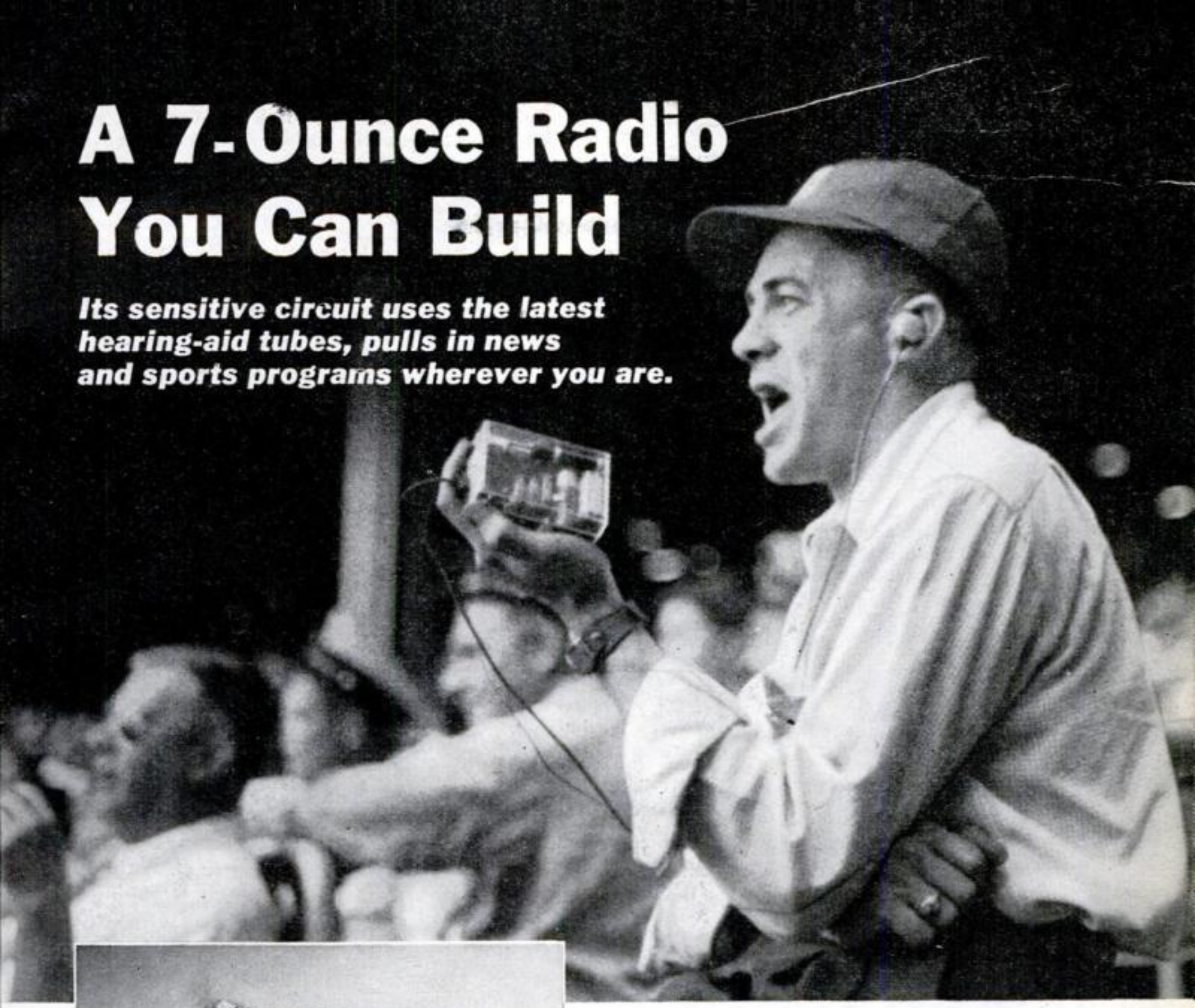




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# A 7-Ounce Radio You Can Build

***Its sensitive circuit uses the latest hearing-aid tubes, pulls in news and sports programs wherever you are.***





**By E. L. Garrett**

SMALL enough to slide into a shirt pocket, this tiny homemade radio is a perfect companion at sports events or any place else that you want to pick up spot broadcasts.

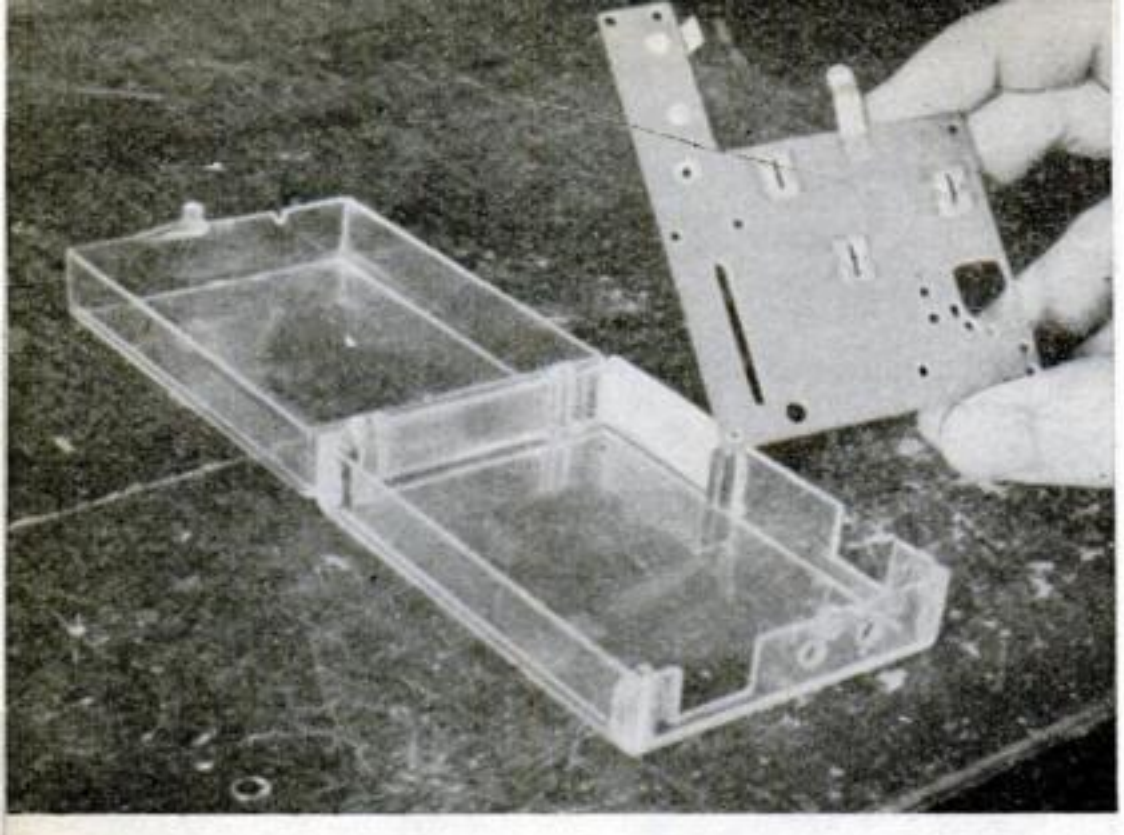
Its clear-plastic case is hardly bigger than a cigarette pack. Fitted inside are three of the newest hearing-aid tubes, long-life batteries and a slug tuner.

The parts are not hard to get; you can buy them from the big mail-order radio suppliers. They will cost about $25 all told, but whatever you can scrounge from your scrap box will pare that down. The radio can be comfortably built in three evenings. It weighs less than half a pound with batteries, antenna and earphone.

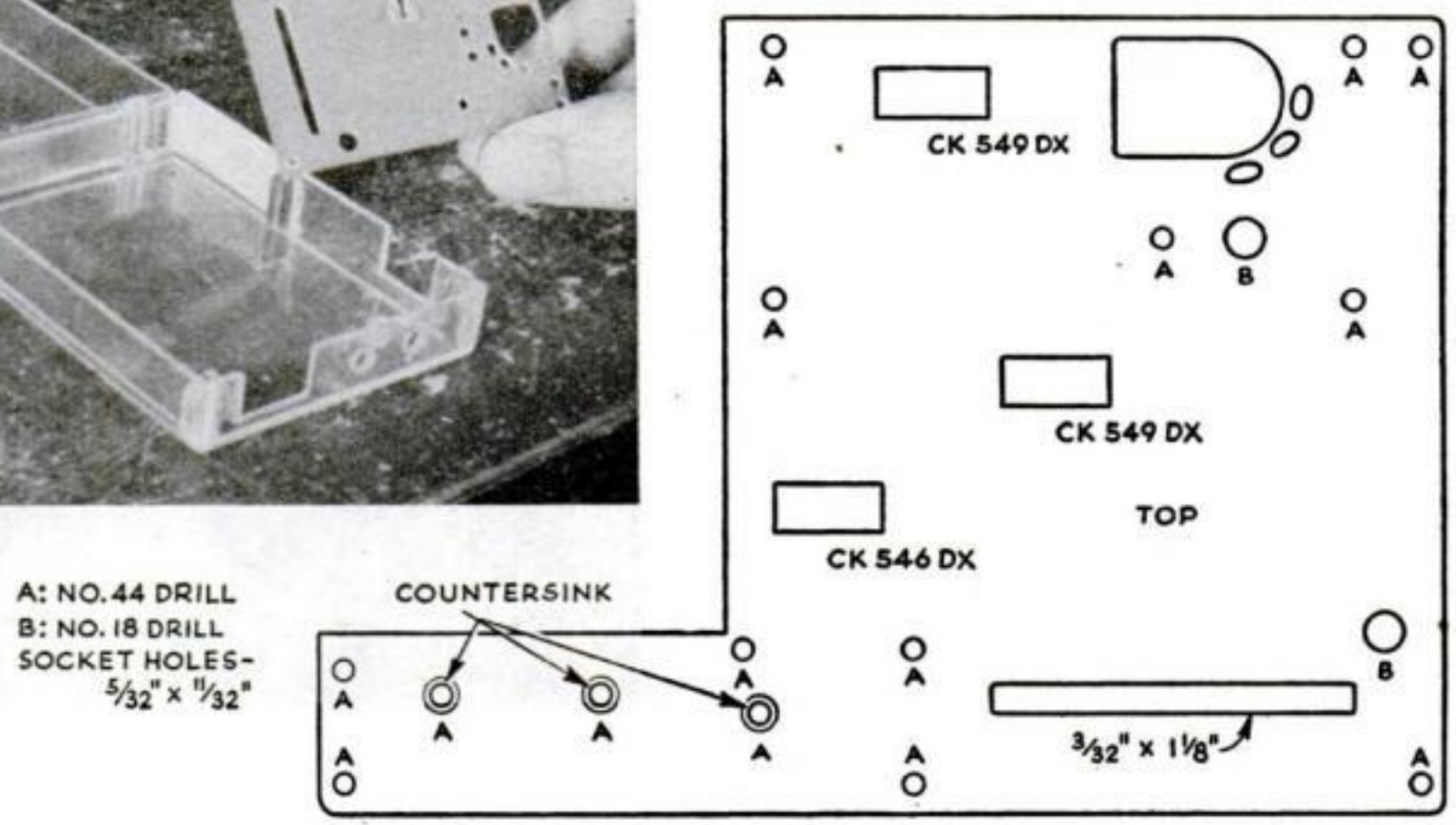
***Case and chassis.*** Don't start work until you've bought a suitable case, since it will govern chassis size and parts layout. I found a small fly box at a fishing-tackle



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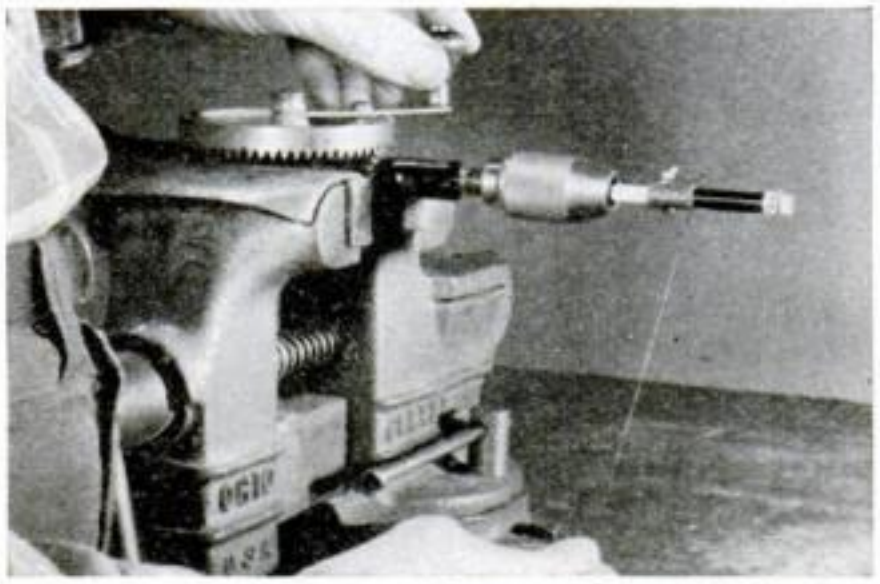


**FLY BOX of transparent plastic makes a sturdy, lightweight case. Two slots in side and end let the ¾" control knobs protrude slightly.**




store that does fine. It measures 1¼" by 2⅜" by 3⅜" outside.

The chassis is a 1/16" panel of Bakelite-impregnated linen, mounted flush within one section of the case on four cemented-in posts. The drawing above is actual size and shows the exact location of all holes.

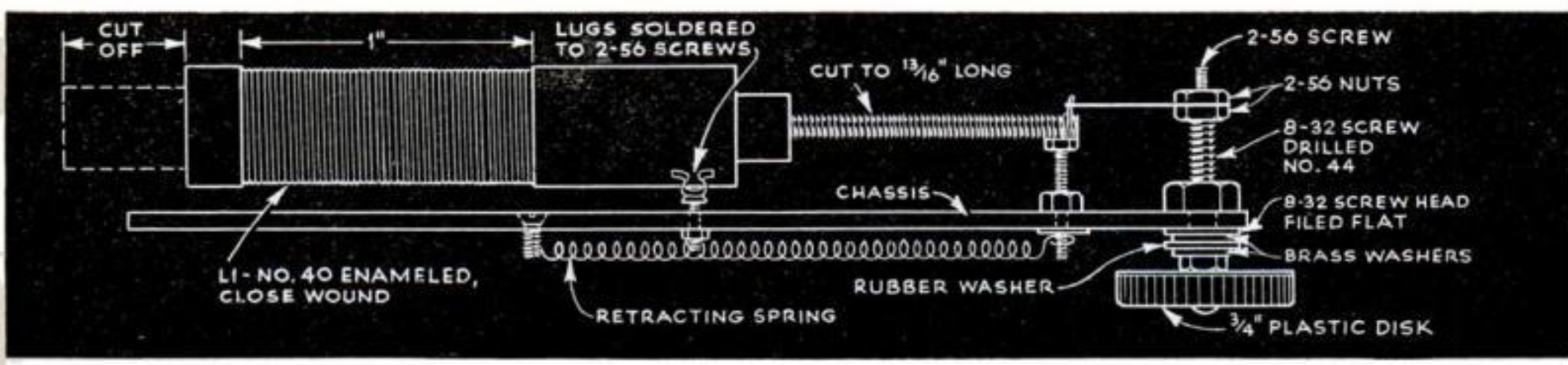


**COIL WINDER is just a clamped hand drill. Use light finger pressure to control wire tension and to lay the turns evenly against each other.**

***Tuner.*** Regular variable condensers of the required range are much too large for tiny receivers. I found a TV horizontal-width coil with a powdered-iron core that could be rewound to make a compact tuner that covers almost the entire broadcast band.

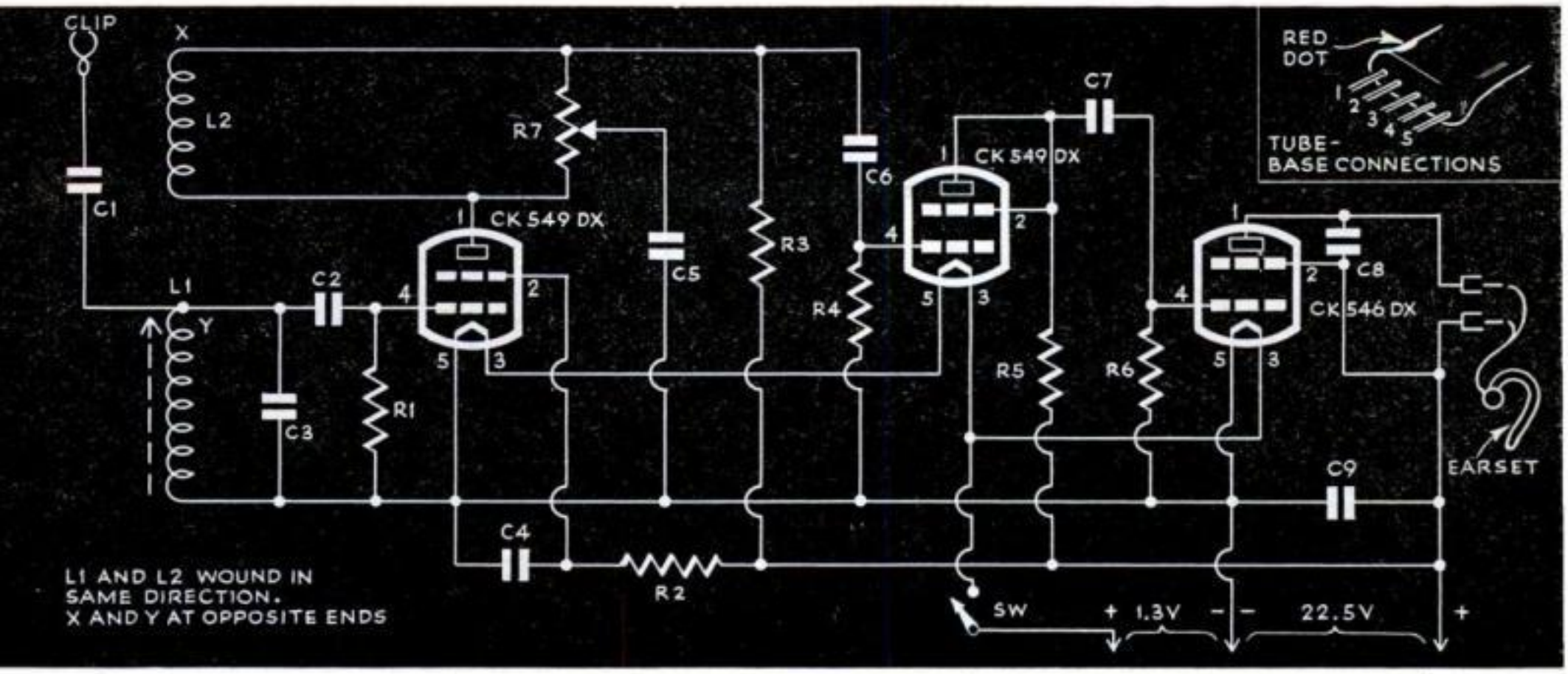
First the original winding was removed and the coil cut short. Very fine wire must be used to get enough turns on the coil. I rigged a winder by clamping a hand drill in the vise, with the coil form pressed on a stub of dowel in the chuck. The grid winding ($L_1$) goes on first—a single layer of No. 40 enameled wire 1" long, which works out to about 315 turns. I held the ends temporarily with bits of tape until I could secure them with dabs of household cement. The ends are soldered to the two lugs on the coil.

The plate winding ($L_2$) is put on a ⅜" paper tube that is later slipped over the grid coil. It consists of 75 turns of No. 28 enameled wire, wound in the same direction as $L_1$.






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## LIST OF PARTS

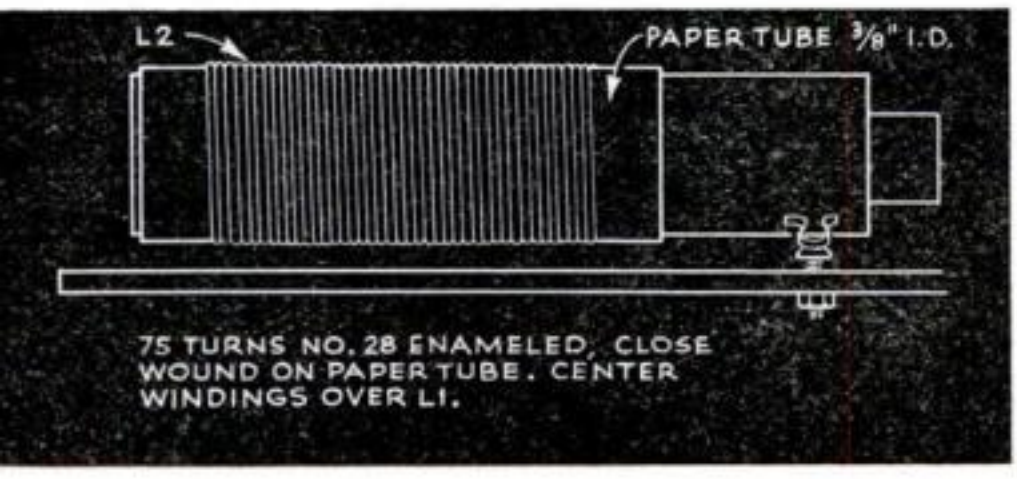
C1, C3: 56-mmf. ceramic.
C2: 250-mmf. ceramic.
C4: .01-mfd. midget paper.
C5: 500-mmf. ceramic.
C6, C7: .001-mfd. midget paper.
C8: .004-mfd. midget paper.
C9: .1-mfd. midget paper.
R1, R4: 1-megohm, ⅓-watt carbon.
R2: 100,000-ohm, ⅓-watt carbon.
R3: 270,000-ohm, ⅓-watt carbon.
R5: 470,000-ohm, ⅓-watt carbon.
R6: 10-megohm, ⅓-watt carbon.
R7: 500,000-ohm hearing-aid potentiometer with switch, used as regeneration control (Centralab B16-218).
L1, L2: Homemade tuning coils.
Raytheon CK549DX subminiature tubes (2).
Raytheon CK546DX subminiature tube.
3 subminiature 5-contact tube sockets.
2-prong crystal socket (for phones).
Fahnestock clip (for antenna).
No. 40 & No. 28 enameled wire for coils.
Iron-core horizontal-width coil for TV (Miller type 6198).
Plastic case.
Midget Earset (Telex, 2,000-ohm).
A Bat.—Mallory RM12 (1.3V).
B Bat.—Olin 0915 (22½V).

I mounted the remade coil on two 2-56 screws soldered to the lugs. The threaded shaft that moves the core was cut short and another 2-56 screw soldered across the end. This screw moves in a guide slot in the chassis, and to it are secured the retracting spring and the end of the heavy thread that draws out the core. As the drawing shows, the set is tuned by turning a ¾" knob that draws up the thread and core.

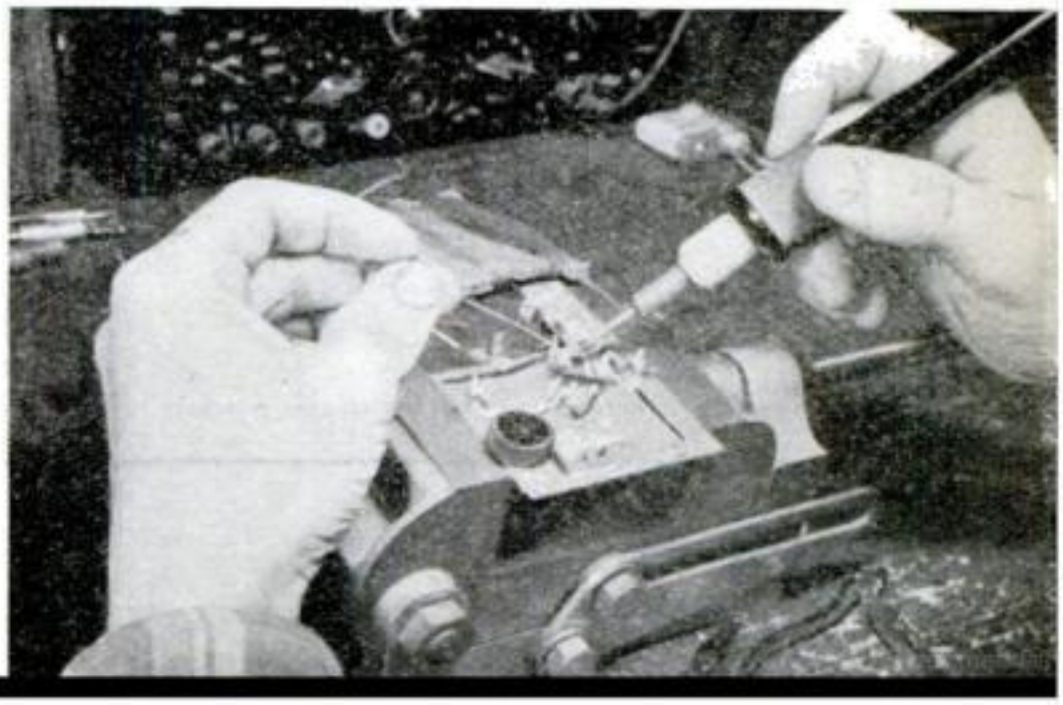
***Wiring.*** A 100-watt iron is too clumsy for so small a job as this. Get one of the little pencil-tip ones and use the lightest hook-up wire you can find. Wire up the filament circuits first and then add the resistors and condensers beneath the chassis.

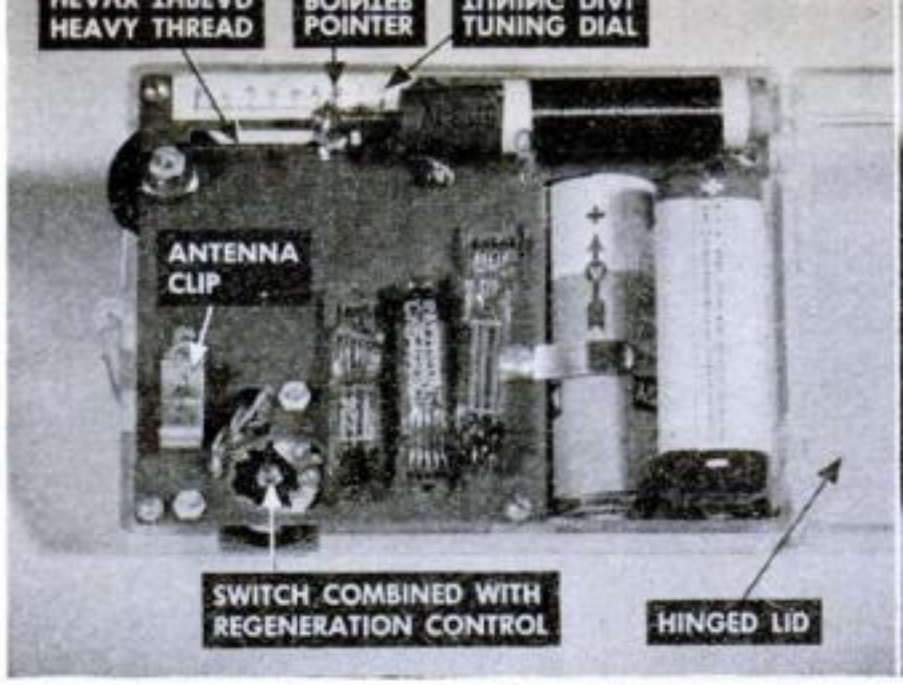
Tube sockets are held in the chassis with household cement, and tubes are retained in their sockets by their leads alone. Clip off the leads ⅜" long, poke the ends in the sockets and gently bend the tubes over parallel with the chassis. Mark one end of each socket with a red dot of fingernail polish so that you can always insert the tubes with the right orientation—the dot is nearest the plate lead.

***Antenna and phones.*** For an antenna

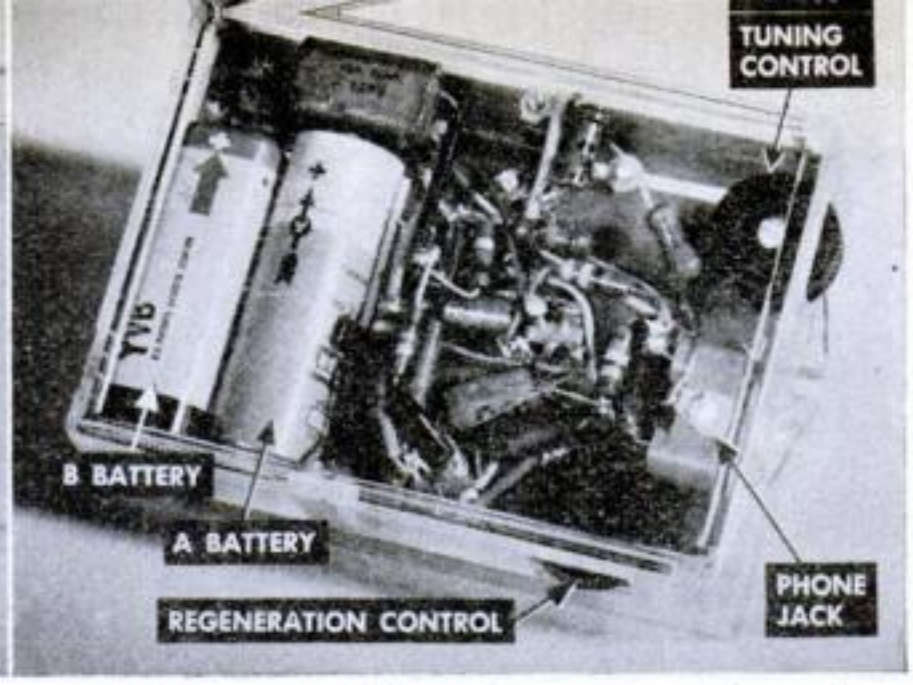



**IT'S FUSSY BUT FUN to wire up midget chassis. A small soldering iron is a must. For convenience, chassis is clamped in a drill-press vise.**






**CASE ISN'T CROWDED** and could even have been a bit smaller. Subminiature tubes are 3/16" thick. Photo is half actual size.



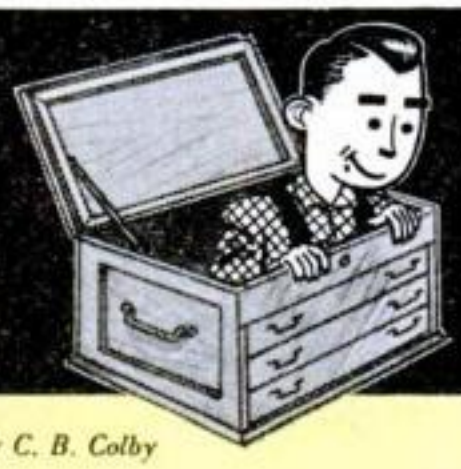

**NEGATIVE ENDS** of batteries press against piece of springy metal cemented inside case. Other ends press against clips in chassis notch.

I simply use a 3′ length of wire with a clip on the end. Close to a station you will receive programs with this alone; farther away, you just attach the clip to any handy metal object—window screen, bed spring, radiator or lamp.

Since regular earphones would dwarf so small a set, I bought a modified hearing-aid phone called an Earset. It comes with a plug, but since I didn't want to cram a bulky phone jack into the case, I attached phone tips to the cord. A crystal socket makes a jack for them in the case.

***Operation.*** It's best to keep the regeneration control near the point of oscillation (squeal) because that sharpens the tuning. This control also functions as a volume control, though it has limited range. For major changes of volume, the best way is to switch the antenna clip to a different metal object that brings in a stronger or weaker signal.

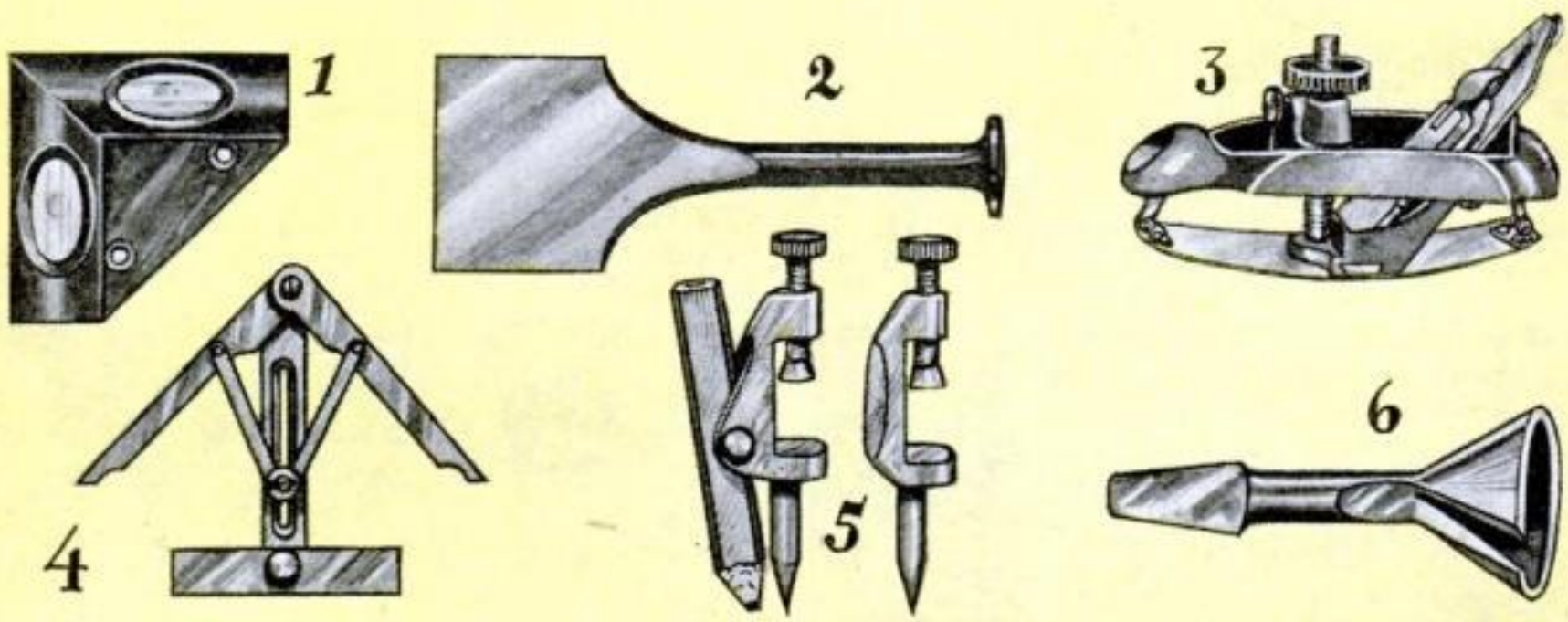
The tubes specified are low-drain ones giving maximum battery life. To save on the parts cost, you could substitute a pair of CK534AX ones and a CK536AX. They will perform the same, use up the A battery a bit faster, but cost substantially less. END



# TOOLBOX TEST

**Sharpen up your knowledge of shop tools. Name these and invert the page to score yourself.**

*By C. B. Colby*




1. Camera level; 2. electrician's cutting chisel; 3. circular plane; 4. angle dividers; 5. trammel points; 6. dowel sharpener.



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# Pint-Sized "Dynaflows" Run Home Machines

***They're the answer to a gadgeteer's dream. One lever controls all speeds forward and back—and acts as a brake, too.***



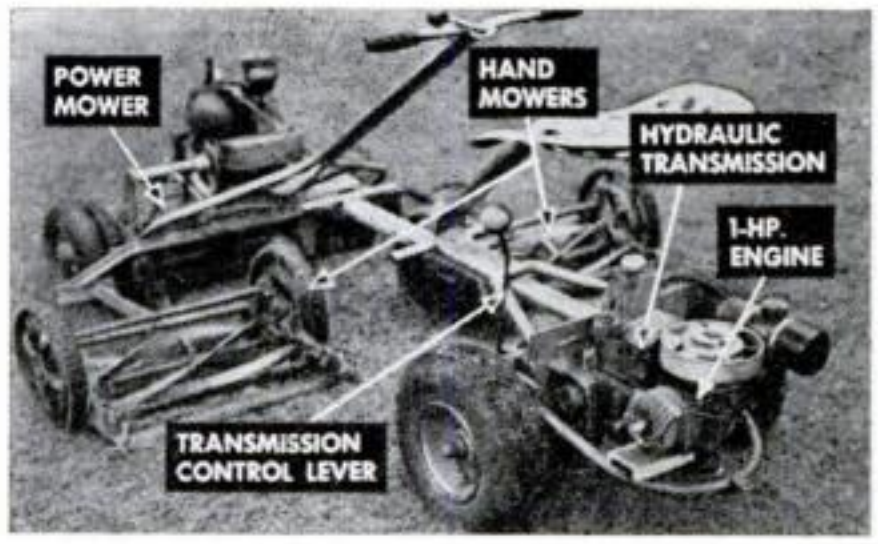

**BOYMOBILE powered by a governor-controlled, two-cycle engine has belt drive to hydraulic unit, chain drive to rear wheel. Driver shoves lever forward to go, pulls to neutral for braking, and back for reverse. Car starts up smoothly, can do 12 miles per hour.**

DETROIT has no corner on automatic drives. With an assist from the Air Force, basement mechanics are putting hydraulic transmissions into homemade scooters, garden tractors and other dream projects.

The assist takes the form of hydraulic speed reducers, originally made by Vickers and Westinghouse for controlling bomber gun turrets. These slick mechanisms originally cost several hundred taxpayer dollars apiece. You can buy one on the surplus market by plunking down around $50—not hay but still a bargain price if you need what it's got.

Heart of unit is a hydraulic pump which your motor drives at constant speed. Valves control the amount and direction of flow of fluid to a hydraulic motor. By shifting a lever you get any speed between zero and the input r.p.m. At neutral position, the output shaft is hydraulically locked, serving as a brake. Flip the lever the other way and you have the same speed range in reverse.

On a drill press, lathe or milling machine such a drive gives stepless speed selection without belt shifting. The photos show how J. H. Jacobs of Osseo, Minn., uses it on gas-driven rigs. By fitting one unit with quick-change couplings, you could switch it around among several machines. END




**GANG GRASS CUTTER is spearheaded by a 1-hp. gas mower to which two hand mowers are hitched. A riding sulky, driven by a 1-hp. engine through a hydraulic transmission, gives underpowered lead machine a boost. Stepless speed control matches sulky's rate to mower's. Over-running ratchets in sulky wheels enable them to turn corners readily.**



**SICKLE MOWER is easier to handle in close quarters and around flower beds with hydraulic unit replacing former drive. It is controlled by single lever.**





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# New Shingles Cover Old Roof

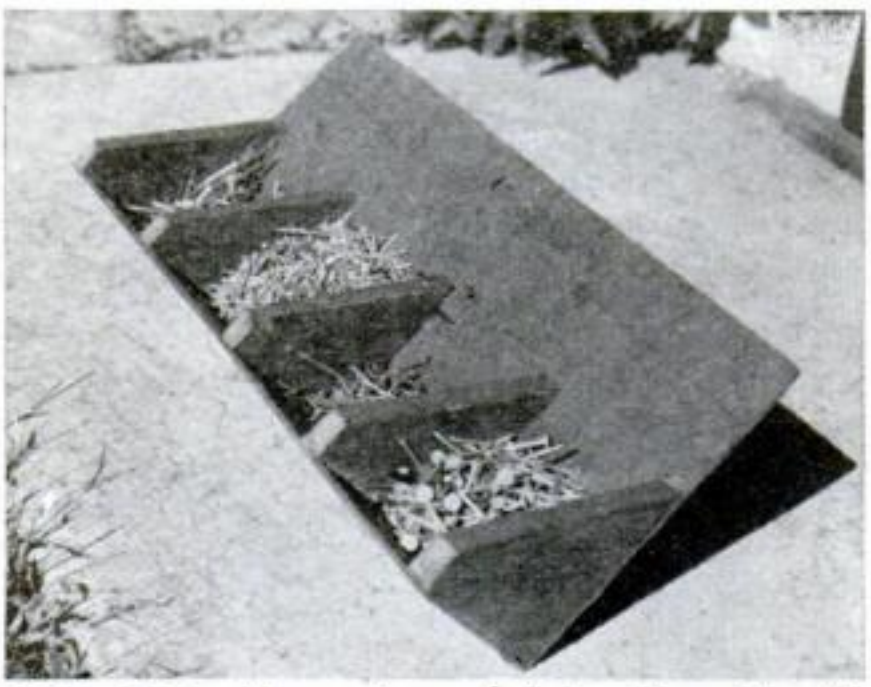
***Save the time and work of ripping off the old shingles. Besides, a double roof gives better insulation and protection.***

THE roof of the old house was in such bad shape that birds heavier than a sparrow were afraid to land on it. I can't prove that, but if you'll look at the photo below, you'll see what I mean about a roof in bad condition. That's why I made it my first project in fixing up the old place.

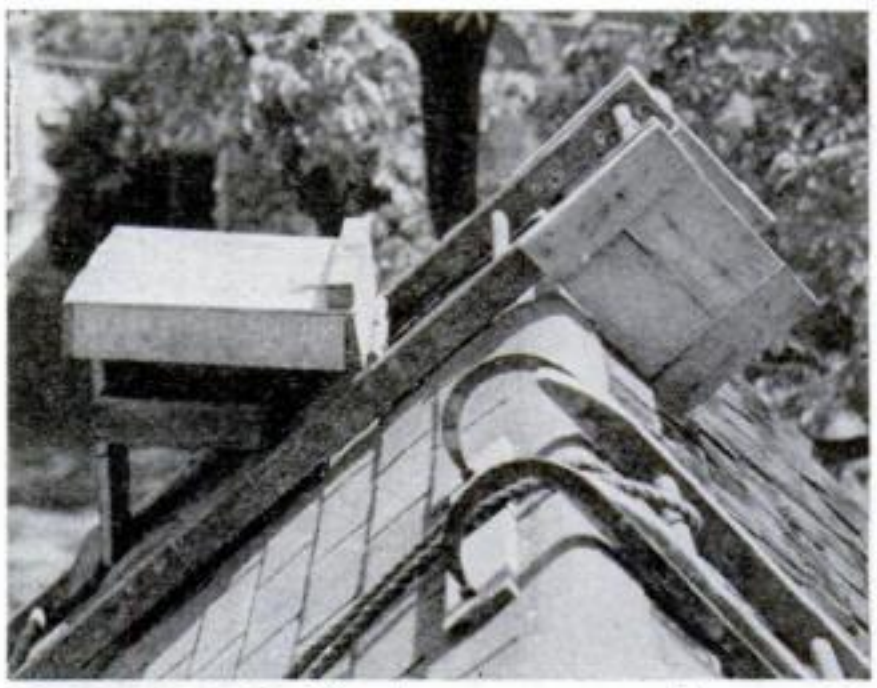
I left the wooden shingles in place and



**Old wood shingles were badly weathered. Roof was re-covered with asphalt shingles over them.**



**NAIL BOX.** Two pieces of hardboard with scraps of wood for partitions form this handy box. Design it to fit slope of roof. It is held in position by resting it against two nails driven in old roof.



**LADDER SETUPS.** Hooks are a must when working on a steep roof. Metal hooks (foreground), bolted to ladder, rest on board that protects new roofing. Other ladder (background) has hooks plus platform for tools.

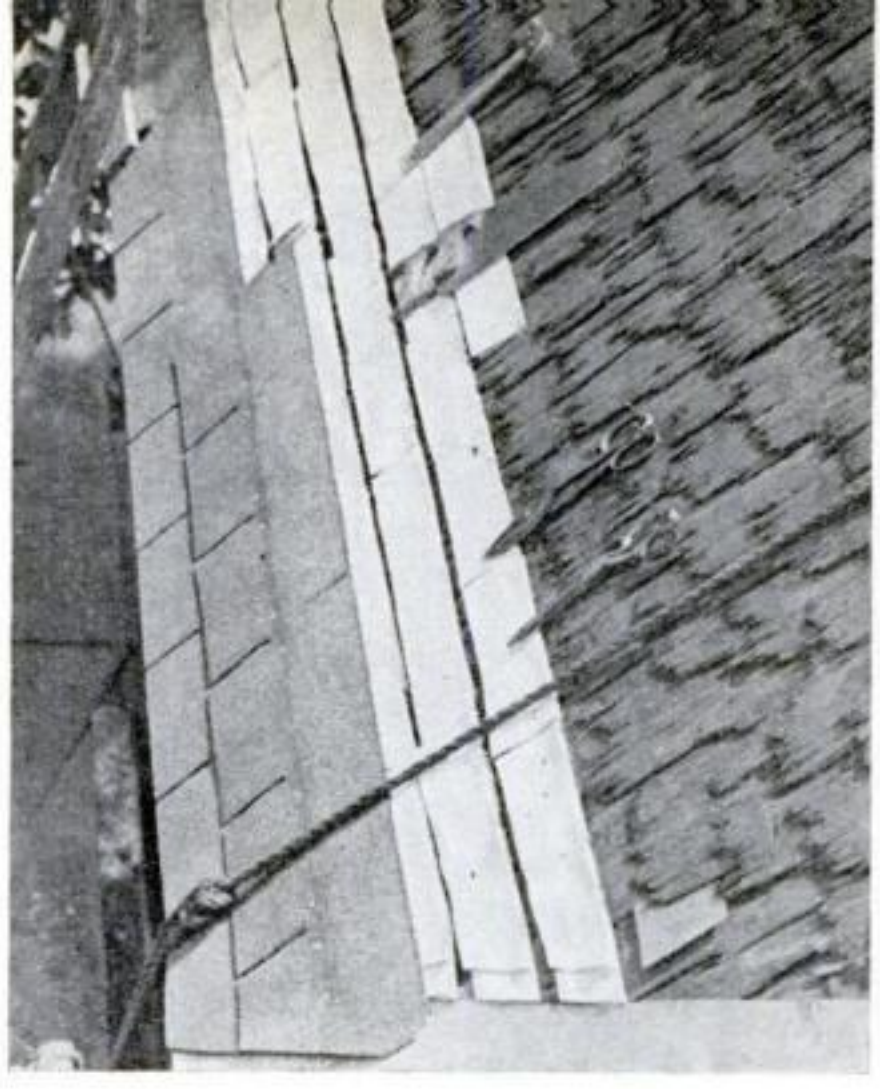


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laid new strip asphalt shingles over them. The ridges were finished with curved ridge roll. This comes in 16″ lengths and should be nailed down with 13″ exposed.

My roofing project may not have been done exactly as a professional roofer would do it, but the finished job looks neat and keeps the rain out.

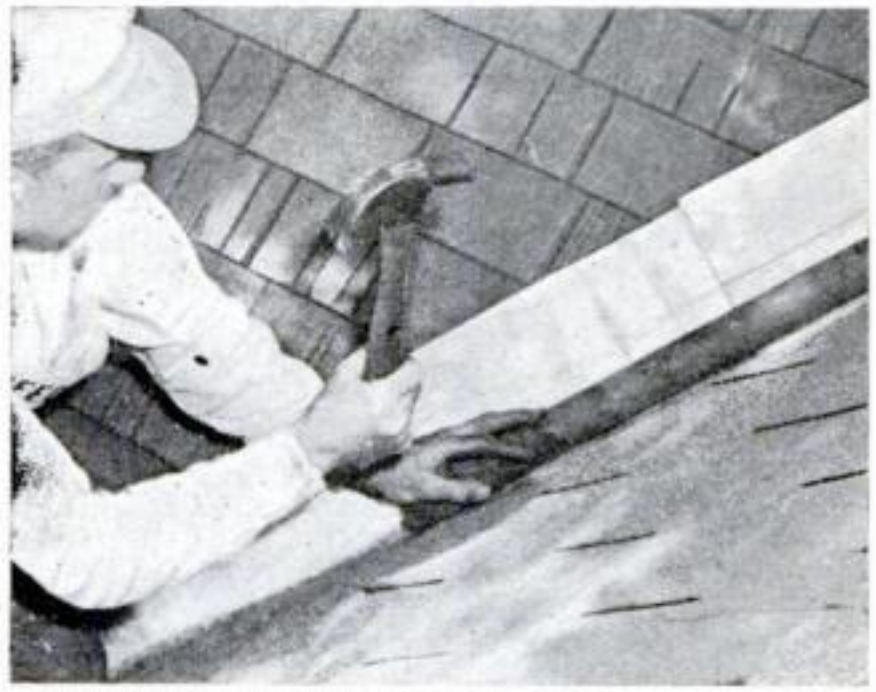
One caution: roofs are easy to fall off of. Use the ladder setups shown and you'll keep both you and your tools in place.—*Emery G. Gregory, Reedsburg, Wis.*



**PREPARING OLD ROOF. Nail down curled shingles. Where parts of old shingles are missing, fill in with pieces cut from asphalt shingles. If old roof is very uneven, a level base (right) for new shingles can be made by folding strips of roofing paper or heavy kraft paper.**

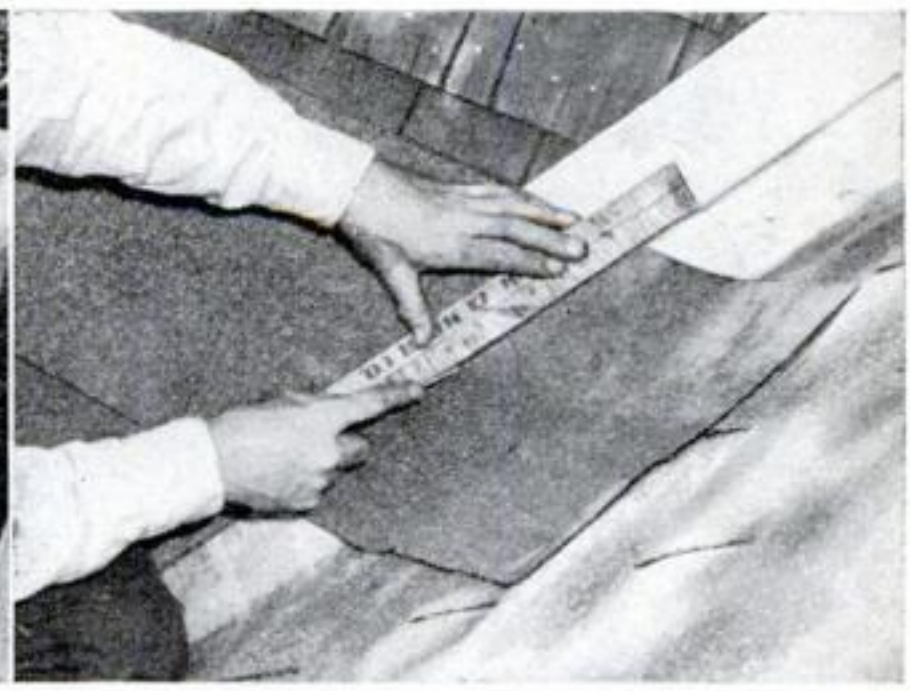


**FLASHING. Strips of metal for the valleys can be partially shaped by forcing them down over ridge of roof. Metals commonly used are copper, galvanized iron or steel, and tin. Cut flashing a little longer than valley.**



**FORMING VALLEY FLASHING. Nail upper end of flashing to roof. Form flashing to contour of valley by rolling 2″ pipe over metal, hammering pipe as you roll it. Then nail edges of flashing to the old roof.**





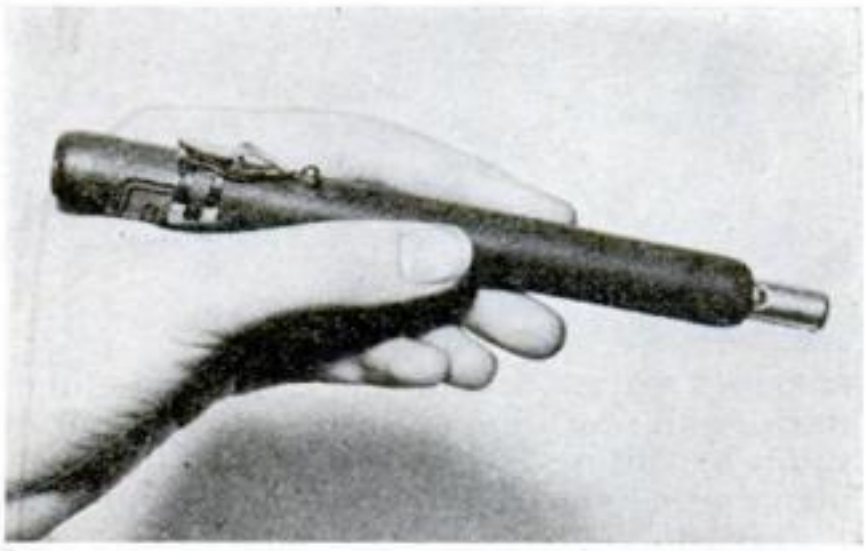
**TAPERING A VALLEY. Like a river valley, a roof valley should be wider at its foot or mouth than at the top. Lay out guide lines on flashing, allowing for a width of 4″ to 6″ at top. Increase this width 1″ every 8″ toward the mouth. Such a taper will help drainage and keep ice and snow from clogging the valley. When shingling along valleys, follow the valley guide lines, marking and cutting the roofing to match them, as shown above.**



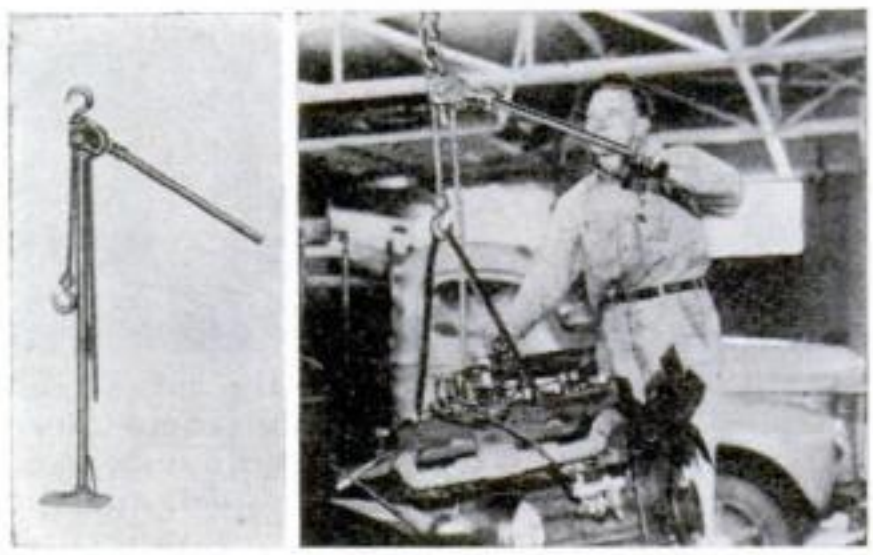
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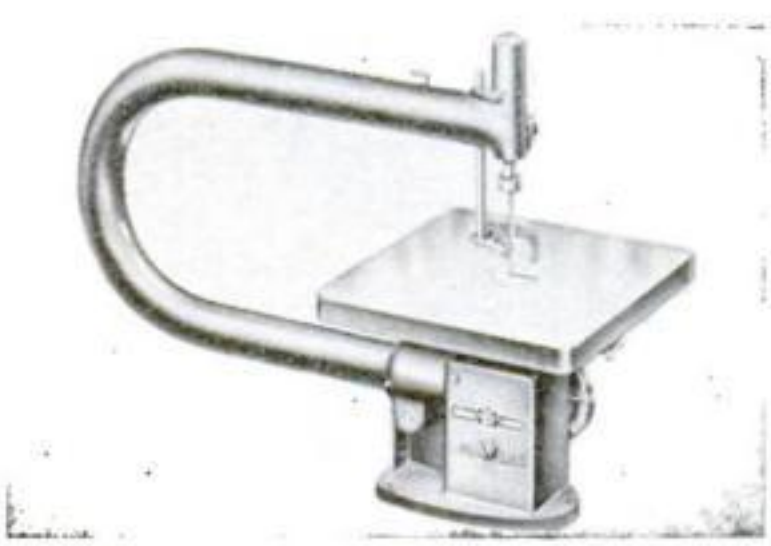

**1 Sanding Disk for Circular Saw.** Any table saw can be quickly converted to a disk sander by substituting this 8″ aluminum disk for the blade. Metals, plastics and glass as well as wood can be ground with the disk. Abrasive disks in five grits are available. The disk comes with coarse paper on one side and fine on the other.



**2 Magnetic Probe Is Adjustable.** The magnet point can be extended or retracted by turning the end knob and the strength of the magnet is controlled by the amount of extension. The tool is used to remove iron or steel particles from holes and other hard-to-reach spots.



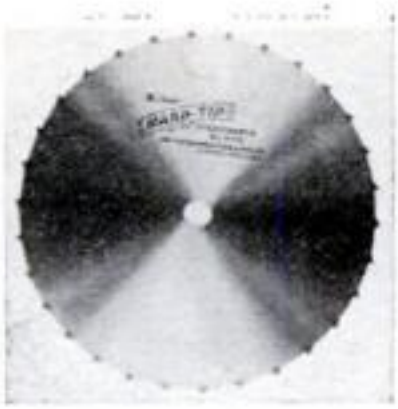
**3 Hoist and Jack Combined.** As a ratchet-type hoist, this tool can be used vertically for overhead lifting (right above). It can also be used horizontally for skidding heavy loads. By setting the tool on its stand, it becomes a jack with a 44″ lift. The Hoist-All is available in one- and two-ton capacities.



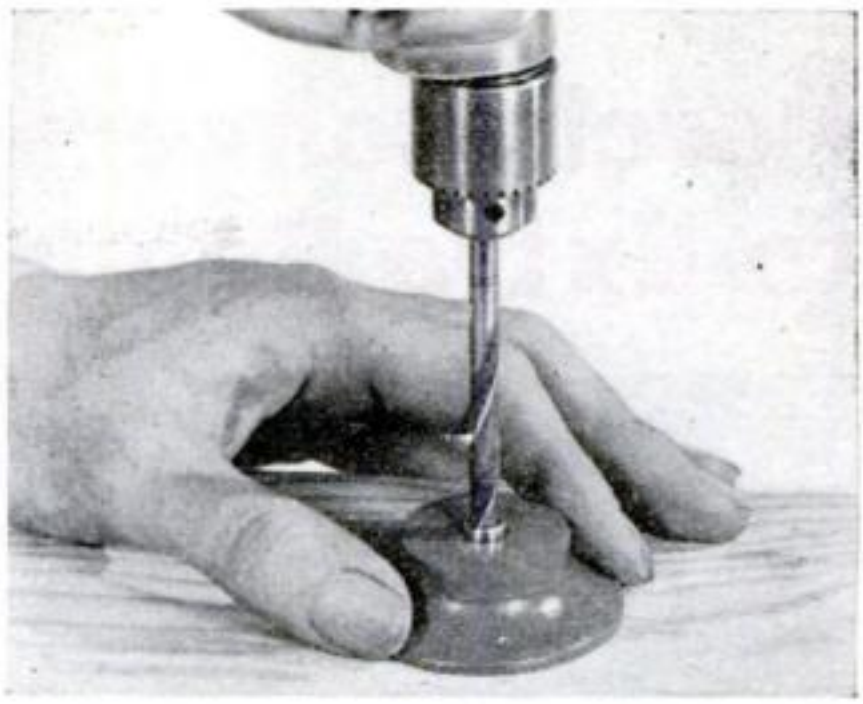
**4 Jigsaw's Overarm Swings Down.** For saber-cutting large boards or big plywood panels, the overarm of this jigsaw can be quickly swung down below the table. The chuck holds all blades and sabers up to 5/16″ wide and files and accessories up to ¼″-diameter shank. To cut from the side, no indexing is necessary. The blade is inserted in the chuck's 90° slot. Specifications include an 11″ by 11″ table, 18″ throat capacity, 2″ maximum depth of cut, and 1,080 strokes per minute with a 2½″ motor pulley on a 1,725-r.p.m. motor.



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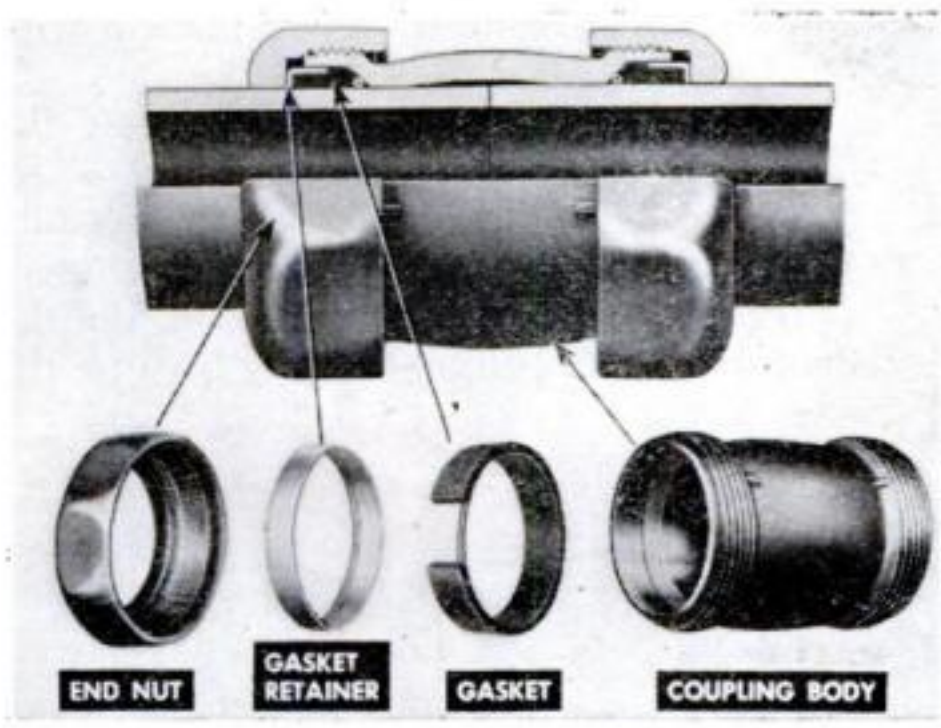
**5 Disposable Blade.** Like a razor blade, a new type of saw blade is priced so that it can be thrown away when it is dull. Yet the maker says it will stay sharp four to six times longer than a conventional blade. Its short teeth are said to cut faster and smoother and require less power than ordinary blades. Two types are made—one for ripping and crosscutting and the other with more teeth for working plywood and for fine crosscutting. For instance, the 7″ ripping blade has 26 teeth while the 7″ fine crosscut blade has 44 teeth. Both types fit table and portable saws. Prices range from $1.77 for a 6″ ripping blade to $8.45 for a 16″ blade for plywood and fine crosscutting.

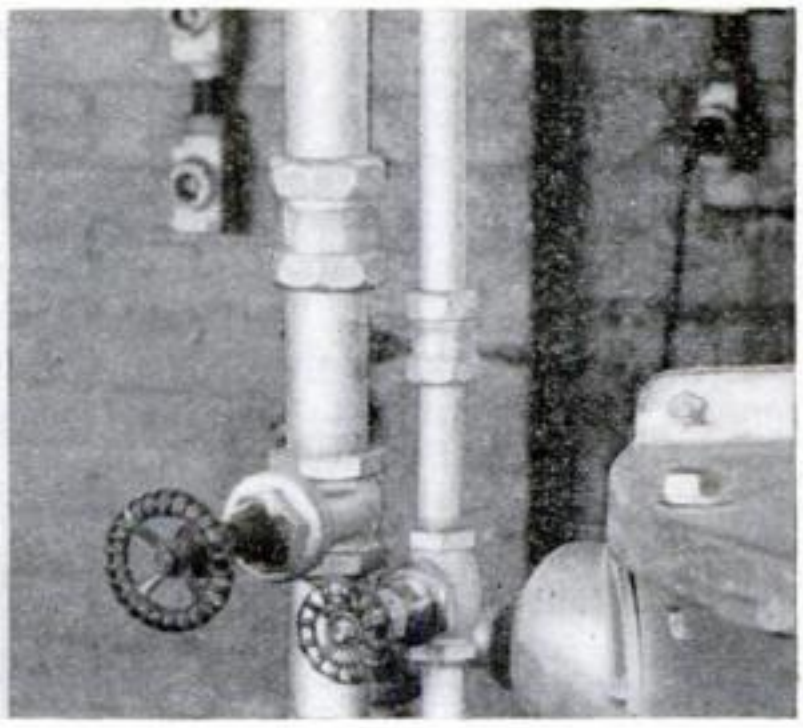


**6 Aligns Portable Electric Drill.** Held or clamped in place, the tool above holds a drill at exactly 90° to the work. It comes with five hardened-steel drill bushings for ⅛″, 5/32″, 3/16″, 7/32″ and ¼″ drills. It is priced at $2.95.




**7 Solid Lubricant for Machining.** This stick-type wax lubricant for cutting tools is said to reduce friction, preserve tool temper and prolong the life of the tool. It comes in a cardboard dispenser 2″ in diameter by 11″ long and is applied either to the tool or to the surface to be machined. Besides machine tools, the lubricant eases driving of wood screws. When used on paper or fabric drills, it prevents burning of the work.



**8 Pipes Joined Without Threading.** It's not necessary to thread or flare pipe ends to join them with these compression fittings. The pipe ends are placed in the fittings and the end nuts tightened. When screwed up on the fitting, the end nuts compress two rubber-compound gaskets that tightly seal the connection. The fittings come as regular couplings, tees, elbows, crosses and adapters for pipe sizes up to 2″. For sizes up to 158″, bolted couplings are available. They adapt to both gas and liquid lines.

*Further information on these tools may be obtained from: 1. Jaxon Co., Box 142, Gasport, N. Y.; 2. General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia; 3. Coffing Hoist Co., Danville, Ill.; 4. Atlas Press Co., 2542 N. Pitcher St., Kalamazoo, Mich.; 5. Heinemann Saw & Mfg. Co., Canton 6, Ohio; 6. J. E. Dunning Co., 14547 S. Madison Ave., Cleveland; 7. The DoAll Co., Des Plaines, Ill.; 8. Dresser Mfg. Division, Bradford, Pa.*



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# Porch Converted to Extra Room



**BEFORE.** Porch was just wasted space except during warm weather. Even then mosquitoes often made it their happy hunting ground.



**AFTER.** Enclosed porch now is another room. Screens keep out bugs, and the many windows let in warm sunlight on cool days.

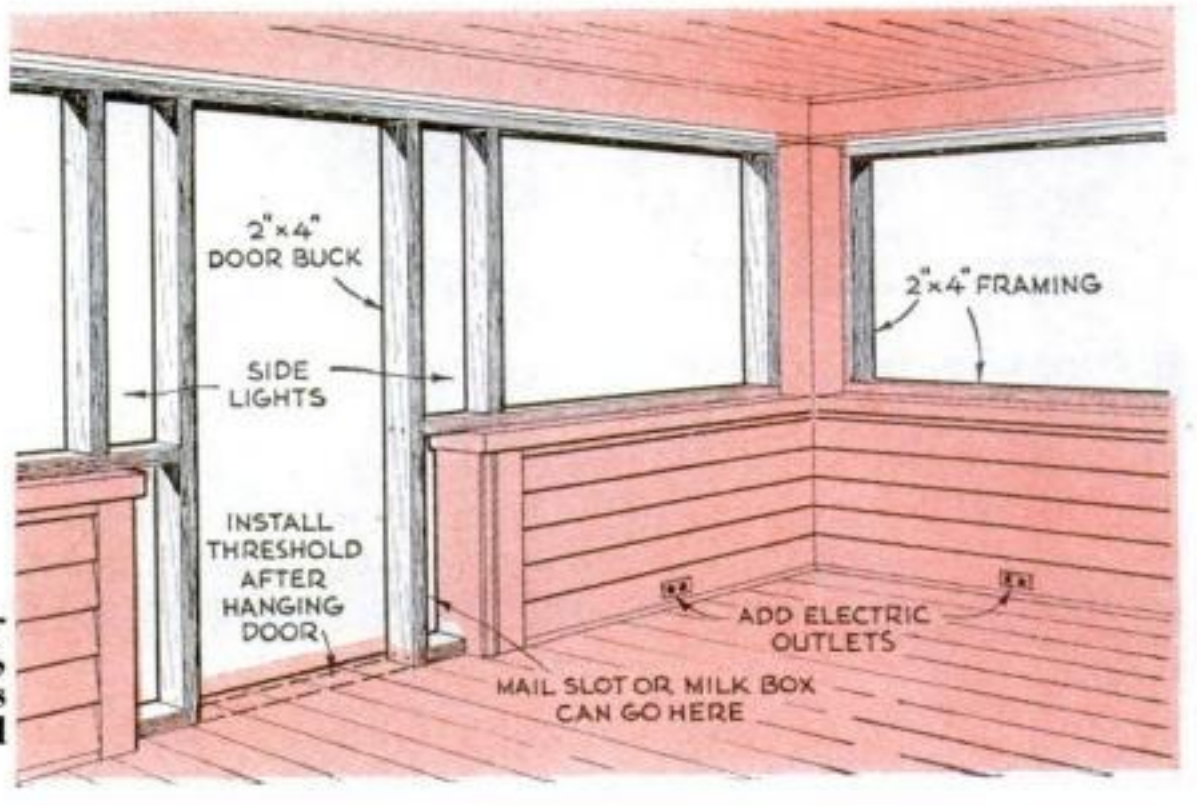
***Extra year-round floor space is the reward you can win. And with a porch like the one shown here, it's neither hard nor costly to do it yourself.***

I TURNED our front porch into a sun parlor, giving us an extra room. In hot weather it still serves as a porch, but a better one, since the windows are screened.

How easily you can duplicate this depends on the way your porch is constructed. If it's the strong, solid type like mine, the job is a simple one of framing in the windows and a door. If it's the less sturdy kind, with light railings, infrequent pier supports, and no ceiling, it will take a little more work. But if you'll settle for something that needn't be insulated or heated, you can convert either type of porch with little trouble.

***Foundation.*** It is important to have good underpinnings, since you're going to increase the load on them. My porch luckily had footings and concrete blocks all around. Where piers are the only support, you may want to add new ones or fill in between them with blocks.

***Closing it in.*** I started by locating the new front door, a standard 1¾" by 3' by 6' 8" size. Then the door buck was nailed in. When I hung the door, I placed the hinges so the door was a nice fit at the sill. But the door wouldn't open all the way because the




**FRAMING is simple. If ready-made windows don't fit exactly, add filler strips. Drainage slots in walls, if any, can be closed with new strips of siding.**



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**MAIL AND MILK are now delivered inside the house. Mail slot is above milk box. Outside door of box is kept closed by spring.**

porch floor sloped for drainage. So I had to rehang the door to clear the slope.

***Installing windows.*** Ready-made units, with sash and frame assembled, make this job a cinch. First the rough framing members were nailed in place and the inside measurements of the openings taken. At the lumberyard, I bought the preassembled window units in the size that was the closest match to the framing openings.

If your railings are too light to support the windows, you can beef them up with extra studs or remove them and start the new framing from the floor.

Before finishing the interior, plan where the electric outlets will come. Depending on construction, it may be more convenient to drop BX cable down inside the wall from the attic, bring it through the house wall, or run it under the floor.

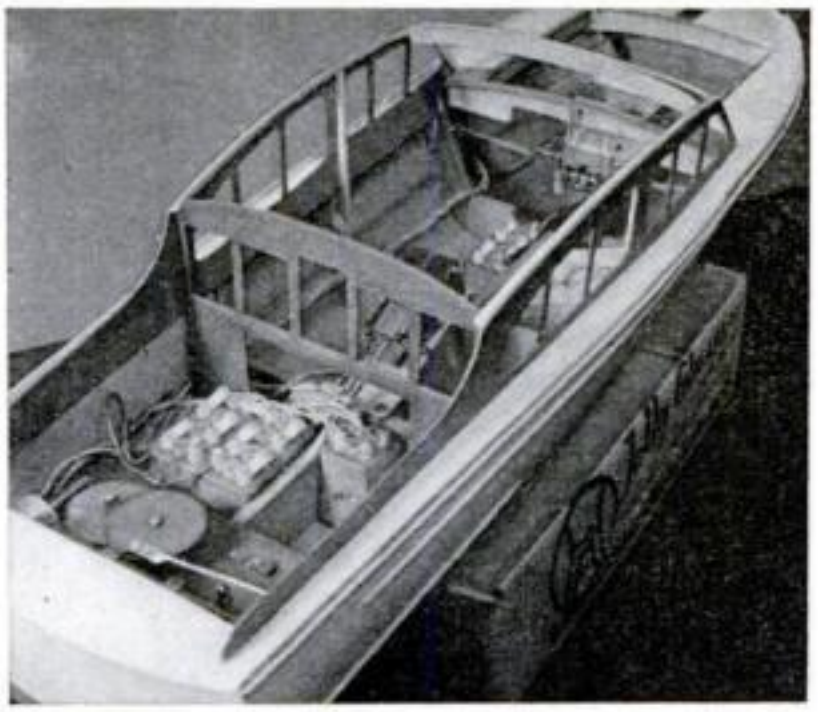
***Insulation.*** For year-round living, your porch would have to be insulated and fitted with storm windows. Batts or reflective insulation can be stapled between the floor and ceiling joists. Holes can be bored in the railings and fill-type insulation poured in.

Porch floors are often rough and uneven. Before laying tile or linoleum, put down a plywood or composition-board subfloor.

And one more thing: don't forget to move the doorbell to its new location.—*Harold Jackson, Kankakee, Ill.*



**FINISHED PORCH is a light and airy additional room for our home. It also serves the children as a rainy-day play area.**



## Small Battery Packs Big Punch

MODEL builders will find many uses for this new plateless storage battery that packs high output into a small space. The battery is only a fifth the size and weight of a conventional storage battery of similar output.

One model application is shown in photo above where the batteries are being used to supply power to drive and steer a radio-controlled boat.

Active ingredients of the cell are silver oxide and zinc. One set of elements is enclosed in a porous sack that doesn't interfere with chemical action but does keep loose material from scaling off and causing internal shorts.

Called Silvercel, the battery is made in sizes from penlight cells up to 100-ampere-hour giants. All cells have a constant potential of 1.5 volts under load. A 20-ampere-hour size is shown below melting a tenpenny nail. *Yardney Electric Corp., 105 Chambers St., NYC.*



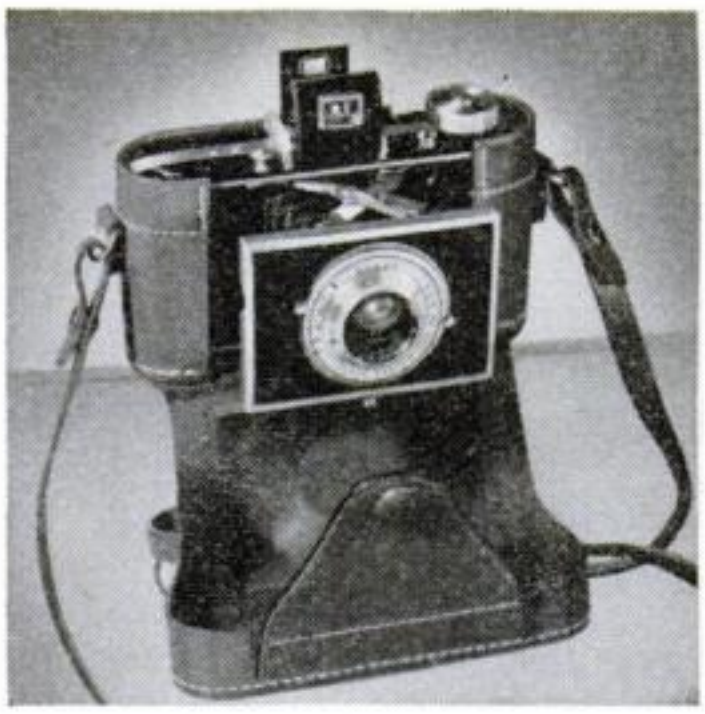



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## A Kodak Miniature Color Camera—there's one for every budget



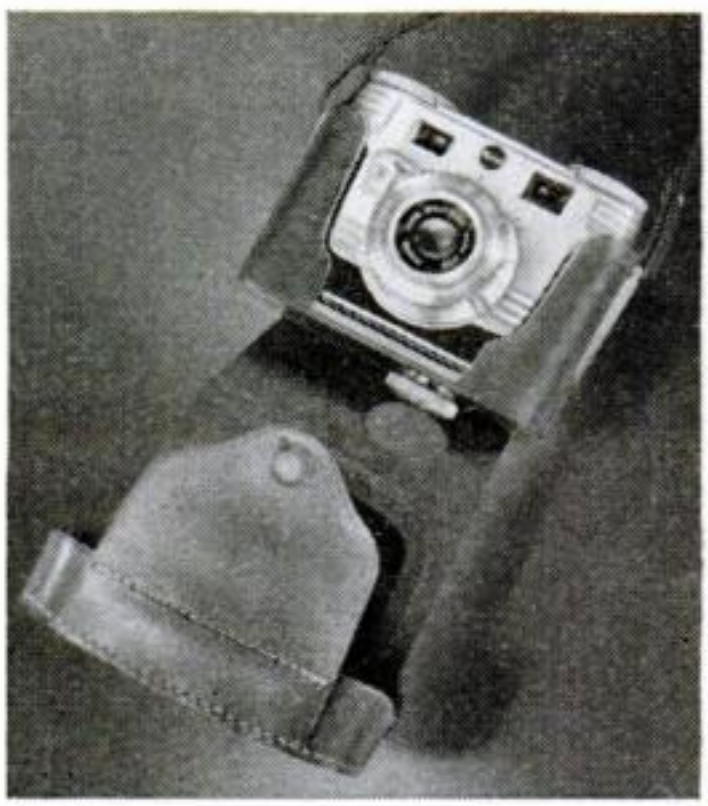
**Fine, extra-thrifty "miniature"**—The budget-priced Kodak Pony 828 Camera gives sharp black-and-white negatives . . . superb color slides on Kodachrome Film . . . gorgeous Kodacolor snapshots. Kodak Anaston *f*/4.5 Lens (Lumenized); Kodak Flash 200 Shutter with built-in "synch." Takes 8-exposure rolls. $31.15. Kodak Field Case, $7.00. Pony 135 Camera for 20- or 36-exposure 35mm. film, $35.75. Kodak Flasholder fits both cameras, $10.55.



**Smallest of the "miniatures" . . . and one of the best**—The palm-size Kodak Flash Bantam *f*/4.5 Camera takes 8 exposures on black-and-white Kodak 828 Films, Kodachrome or Kodacolor 828 Film. Lens is superbly corrected Kodak Anastar *f*/4.5 (Lumenized). Flash synchronization is built into the 1/200 shutter. Automatic film stop and body shutter release make for fast, simple operation. $56.00. Kodak Flasholder, $10.55. Kodak Field Case, $7.00.

# How to make the most of Autumn's

Every golden field, every fiery maple cries out to be "snapped" in color. So be sure to take along your camera—and plenty of color film—on Fall outings. You'll see great picture possibilities at every bend in the road.



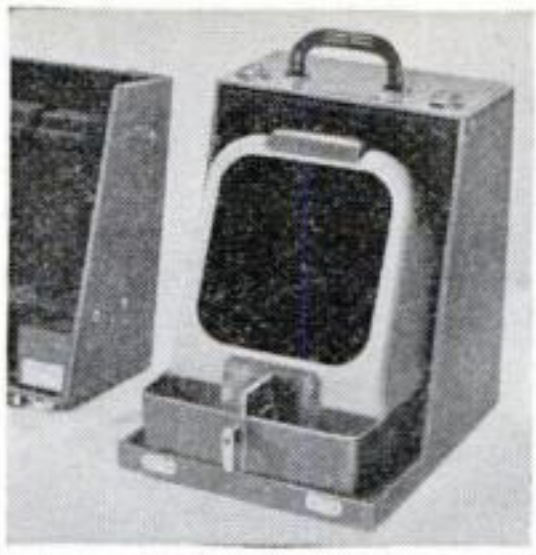
**Precision range-finder "miniature"**—The Kodak Signet 35 Camera, with world-famous Ektar Lens (*f*/3.5), produces sharp, brilliant color slides for projection or full-color prints with 20- or 36-exposure Kodachrome 135 Film; also clear black-and-white pictures with Kodak 135 Films. Has feather-touch shutter release bar, shutter with speeds up to 1/300, built-in flash synchronization. $92.50. Flasholder, $10.55. Kodak Field Case, $8.50.



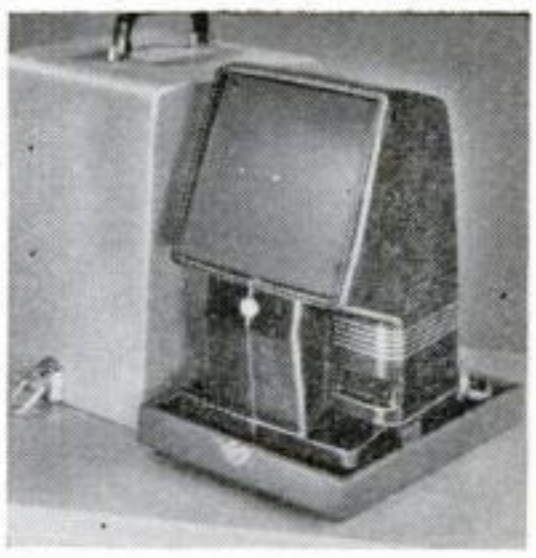
**Ultra-fast "miniature" in a new model**—The Kodak Retina IIa Camera now features rapid film-advance lever, built-in flash. Also has fast *f*/2.0 coated lens in a 1/500 shutter, range and view finder combined in a single window, automatic double-exposure prevention, film stop, and counter. Takes 20- or 36-exposure black-and-white Kodak 135 Films or Kodachrome 135 Film. $164.10. Flasholder, $10.55. Kodak Field Case, $10.50.

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## A projector or viewer—to show your color slides at their brilliant best



**Kodaslide Table Viewer, Model A**—Projector, screen, slide changer in one compact unit. Projects brilliant images even in a lighted room. Takes 75 cardboard or 30 double glass slides. $97.50. Carrying case, $27.50.



**Kodaslide Table Viewer, 4X**—Enlarges slides over four times on built-in screen. No fuss, no bother. Just snap it on and enjoy your handiwork. $49.50. Carrying case, $15.50.



**Kodaslide Merit Projector**—Budget-priced instrument for brilliant screenings. New jar-proof slide feeding; Kodak Projection Ektanon Lens, 5-inch *f*/3.5 (Lumenized); built-in elevation device; cool operation. $26.10. Carrying case, $9.50.



**Kodaslide Projector, Master Model**—Fast lenses and 1000-watt lamp can deliver more light to screen than any other 2x2-inch slide projector. Turbine-type fan cools both sides of slide. Choice of 4 projection lenses. From $169.00. Carrying case, $50.00.

# color-picture opportunities

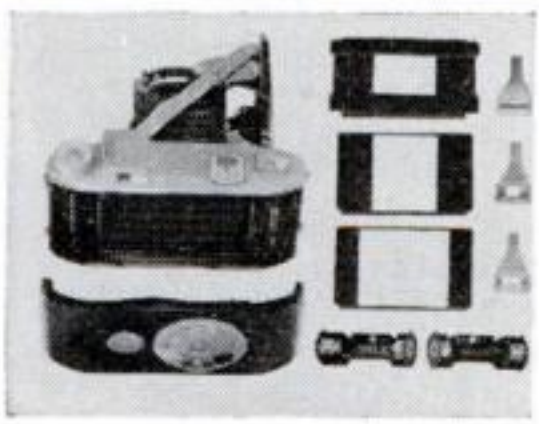
## Some suggestions for the perfectionist



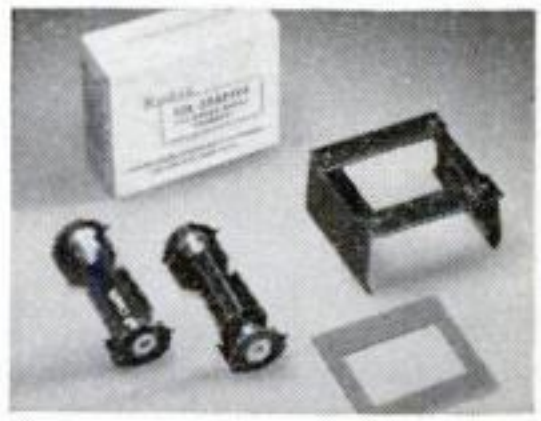
**If you want your subject to stand out sharply** against a dark blue sky in color pictures, use a Kodak Pola-Screen. From $6.75. Kodak Pola-Screen Viewer for previewing effect, $6.75.



**Kodak Skylight Filter**—"Warms up" many color pictures. $1.65 up. To cut bluishness in flash pictures with Kodachrome Film, Type A, try *Kodak Light Balancing Filter 81C*. From $2.07.



**Inexpensive kits adapt Kodak Tourist and Reflex Cameras for Kodachrome Film**—Kodak Tourist Adapter Kit for deluxe model "Tourists," $13.25 (*left*), and the Kodak 828 Adapter for Kodak Reflex Cameras, $4.59 (*right*), permit picture-taking in full color on Kodachrome or Kodacolor 828 Film.





**Kodak Auto-Release**—Trips shutter, gets the photographer into the picture. $3.86.



**Deluxe file**—Kodaslide Compartment File has 12 swing-out compartments for 240 cardboard or 96 glass slides. $3.94.



**Protects valuable slides**—Inexpensive metal Kodaslide File Box holds 150 cardboard or 53 glass slides. $1.57.

See your Kodak dealer for all your photo needs.
He'll be happy to "talk shop" anytime you drop in.

*Prices subject to change without notice and include Federal Tax where applicable.*

**EASTMAN KODAK COMPANY, ROCHESTER 4, N.Y.**

Kodak
TRADE-MARK

[*Continued from page 157*]

would have bogged down. But not the MG. It will go anywhere, roads or no roads.

Evidently that's one of the things that warms the hearts of owners, including those in the MG Car Club. Yes, that's the nub of the cult. Of the 17,000-odd MGs roaming the U.S. highways today, 1,400 have owners belonging to the Car Club.



More are joining every day. The 600 MG dealers in this country encourage it.

The dealer-owner relationship is one for the book. Damon and Pythias couldn't be closer despite the fact that service on MGs —members of the cult tell me—hasn't been good. It's getting better, but it has some distance to go. Parts are hard to get.

Close to the water, the sand on the beach was fairly hard-packed, and I tried out the acceleration.

*There's 30 miles an hour on the stop watch in six seconds . . . now, again, . . . there's 30 in 5.9 seconds . . . now . . . there's 50 in 14.7 seconds . . .*

Like any long-stroke engine, the MG's has a high "thermal efficiency"—it takes full advantage of the fuel used but pays a penalty in a lower mechanical efficiency.

*I think I can beat the manufacturer's specification to 60 miles an hour . . . off we go . . . 25 . . . 35 . . . 45 . . . and 60 in exactly 18.7 seconds.*

That was almost six seconds better than the book said. The speedometer calibrated out just over 56 miles an hour at an indicated 60.

### *Stops Fast, Too*

As we started for home, I picked a deserted stretch of pavement near the beach, rolled the MG to an indicated 60, and jammed on the brakes. The result was surprisingly good—the car stopped dead in 132 feet.

Out on the highway, I again lost my wife, who had commandeered an unwilling Bill for the return trip. The MG felt rubbery. All sports cars do, compared to racing cars. They contain a lot of rubber insulation. If they didn't, they'd beat you to death with their hard springing. The springing is hard, of course, so that they will take the turns rigidly in road racing.

As I parked in front of the house, Pem Cornelius of Indianapolis, an old friend, came sauntering out.

It had begun to sprinkle, and I started wrestling with the top and side curtains.

"I wonder," remarked Pem, giving me a hand on the top, "whether I could get into this thing."

"You're not figuring on buying one!"

He rubbed his chin. "I might," he mused, "it's quite a car."

I don't know. I guess that you don't explain cults. You just accept them. It could be great fun. END

## FACTS ON '52 MG

**Model:** Midget series TD two-passenger convertible.

**Engine:** 4-cyl. valve-in-head; 54.4 hp. at 5,200 r.p.m.; bore and stroke, 2 39/64" by 3 35/64"; compression ratio, 7.25:1; piston displacement, 76.28 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 2,458; crankshaft bearing surface, 23.31 sq. in.; torque, 63.9 lb.-ft. at 2,600 r.p.m.

**Weight:** 1,904 lb. (without load); per hp., 35 lb.

**Transmission:** four-speed manual shift; rear-axle ratio, 5.125:1.

**Steering ratio:** 13.75:1; radius of turning circle, 15' 7½".

**Effective brake-lining area:** 105 sq. in.

**Springs:** front, coil; rear, semi-elliptic.

**Outside dimensions:** height (no load), 53" to top of windshield; over-all length with bumpers and guards, 145"; width, 58⅝"; wheelbase, 94"; overhang, front 20", rear 34"; tread, front 47⅜", rear 50".

**Inside dimensions:** seat-cushion widths, 17½" each, divided seat; leg room, 48½"; headroom with top up, 36"; seat height, 8"; vertical distance, steering wheel to seat cushion with seat in mid-position, 6⅞"; seat adjustment, horizontal 4¼", vertical none.

**Tire size:** 5.50 by 15.



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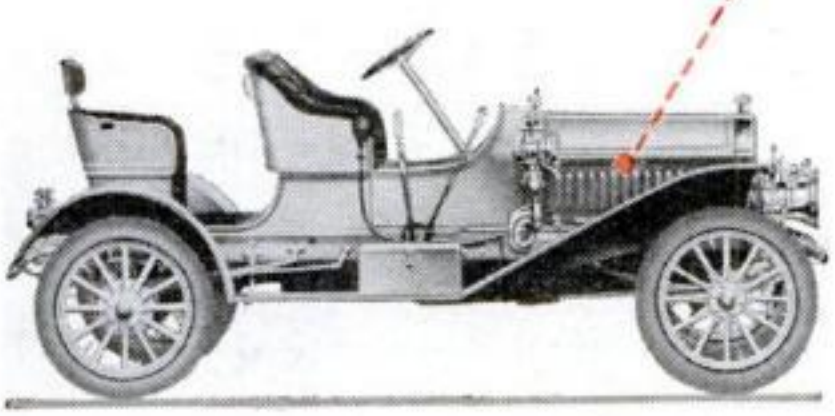
# BUILDS THE FIRE IN BUICK'S FIREBALL ENGINE

AC SPARK PLUGS

PATENTED CORALOX INSULATOR




## ... AND USED ON EVERY NEW BUICK SINCE 1908



The latest thing in 1908, this model "S" Buick had a 4-cylinder, 29-horsepower engine--wood spoke wheels with 32" x 4" tires--three oil lamps, gas headlights, horn and repair outfit as standard equipment. The top and double rumble seat were extra.

Buick engineers specified AC Spark Plugs as factory equipment 'way back in 1908--have continued to do so for 44 years.

ACs with patented *CORALOX* Insulator are a "natural" for Buick's famous high-compression, high-powered Fireball engine. *CORALOX* provides better electrical insulation--greater resistance to fouling--surer firing at every engine speed and temperature.

You can get these *CORALOX* advantages for your car, too, no matter what the make or model--for there's an AC type specially engineered for every type of engine.

AC SPARK PLUG DIVISION GM GENERAL MOTORS CORPORATION



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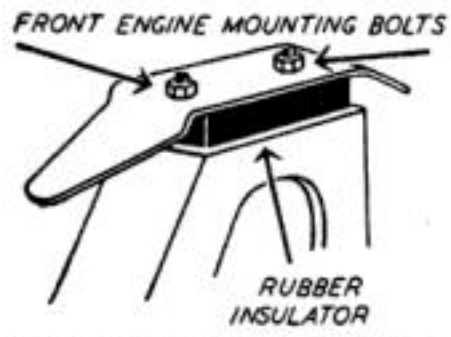


# Care and Feeding of Engines

BY S. P. CORP

## ALIGN THAT ENGINE

When the engine is installed in a passenger car, rubber insulators are used at each engine mounting support. Support bolts are drawn down just enough to fasten the engine securely to the frame. The rubber insulators deaden engine noises and prevent them from being transmitted up into the car.




When engines are replaced, it is important that they be properly aligned, otherwise severe engine vibration will be felt in the car.

To correct such a condition, loosen the exhaust support brackets and all engine mounting bolts. Do not remove the bolts. Start the engine and accelerate it a few times so that the engine will align itself. Then tighten engine mounting bolts and exhaust support brackets.

## IT WON'T BE LONG

Before we talk to you again, there will be frost in the northern states. Between now and then, make these six checks to insure easy starting on the first cold morning:

**1.** Hydrometer-test your battery. If specific gravity is below 1.250, have it recharged. Be sure to see that battery cables are tight and not corroded. Clean cables are important to easy starting.

**2.** Check distributor cap for cracks. Clean cap and all wires; replace worn wires. Good ignition is vital to quick starting. Remove one wire from spark plug and hold 3/16" from engine block. Start engine. If spark jumps gap evenly, ignition is O.K. If erratic, check distributor points for correct spacing and replace any that are burned or pitted. See that all connections are tight.

**3.** Remove and clean all spark plugs, replacing any with cracked porcelain. Regap to car manufacturer's specifications. Install new gaskets, tighten plugs finger-tight, then use socket wrench just enough to squeeze the gasket.

**4.** If starter is sluggish, check brushes and commutator. A dirty starter can make the engine start hard.

**5.** Use a light oil for winter driving.

**6.** Depress clutch pedal for cold-weather starting.

## INSTALL KROMEX RING SETS

To get all the winter power you need, install Sealed Power KromeX Ring Sets, specially engineered for late-model cars and trucks. Top compression rings and steel rails of oil rings have chrome faces to fight heat, friction, corrosion, and abrasion. Write Dept. H-9, Sealed Power Corp., Muskegon, Mich., for new free booklet, "MORE POWER, Less Oil, Less Gas."



## Gus Pulls a Trick Play

[Continued from page 182]

ing the carburetor. I'm going to take a look at the pump, in spite of its being new."

"Okay, go ahead. I only hope you have better results than those other birds!"

"It never hurts to try. I'll make it as quick as I can."

Gus disconnected the fuel pump, carried it inside and began dismantling it. Thompson followed him into the garage. Gus emptied the gas and began looking.

"At least the fuel got this far!"

The diaphragm wasn't worn. He hadn't expected it to be, but on second glance, he noticed he could scrape some sort of residue off the diaphragm surface.

### *Trouble Must Be in Fuel Pump*

"Funny thing, but it *is* your fuel pump!"

"Oh, no!"

"Sure. See this gummy stuff on the diaphragm? And look at these springs and valves. The gum locked the valves so that the gas wouldn't pass on to the carburetor. The springs that actuate the valves haven't got the freedom they should have, and offhand I'd say it was coming from the diaphragm there. These diaphragms are coated to make them last longer, and that outer surfacing is flaking off."

"I might expect one lemon, but not three in a row!"

"Oh, it isn't that. This is a perfectly satisfactory brand."

### *Nothing New Has Been Added*

"Well, what now?"

"We've got to find a cause. It's something the other mechanics didn't bother checking, evidently. First, we're going to look at your gas tank. Do you know if the regular driver has been using any gas-tank additives—you know, canned tune-ups, valve oils, anything like that?"

"No, I'm sure of it. Nothing but high octane."

"I see. Some of these additives are okay, and some are inclined to gum up the engines. All right, that's one possibility eliminated."

They went out and Gus opened the drain cock on the tank, letting the gas run into a couple of five-gallon cans. He watched the color down to the last drop. There was no sign of anything foreign.

"See anything? It's quarter to eleven. . ."

[Continued on page 234]



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# REMODEL IT YOURSELF... USE THE BEST




## PUT YOUR FOOT DOWN... INSIST ON **GOLD SEAL®** **LINOLEUM TILE!**

**Put down Gold Seal Linoleum Tile** and know that you've got the *right* tile over your wood floor. For this is *genuine* inlaid linoleum . . . *flexible* . . . designed to take the up-and-down movement of the average wood floor without a strain. It *can't* snap, chip, or shatter!

**And Gold Seal Linoleum Tile practically installs itself!** These tiles are precision-cut into *true, right-angled 9"x9" squares*. They slice into odd shapes with just a knife . . . without heating, scoring, or hacksawing.

**It's greaseproof to household fats and oils.** Even spatters from a hot frying pan won't pit, soften, discolor, or disintegrate it.

**What a floor you get!** A smooth, warmly colorful floor, with all the quiet, restful resilience of the very finest custom installations . . . *at just a fraction of the cost!* Satisfaction guaranteed or your money back!

## ABOVE ALL, USE **GOLD SEAL CONGOWALL®** IT'S UP FOR GOOD IN OVER 5,000,000 HOMES!

**There's only one Gold Seal Congowall** . . . the baked-enamel wall covering that looks, feels, and cleans like expensive ceramic tile . . . *never* needs refinishing, repairing or repainting.

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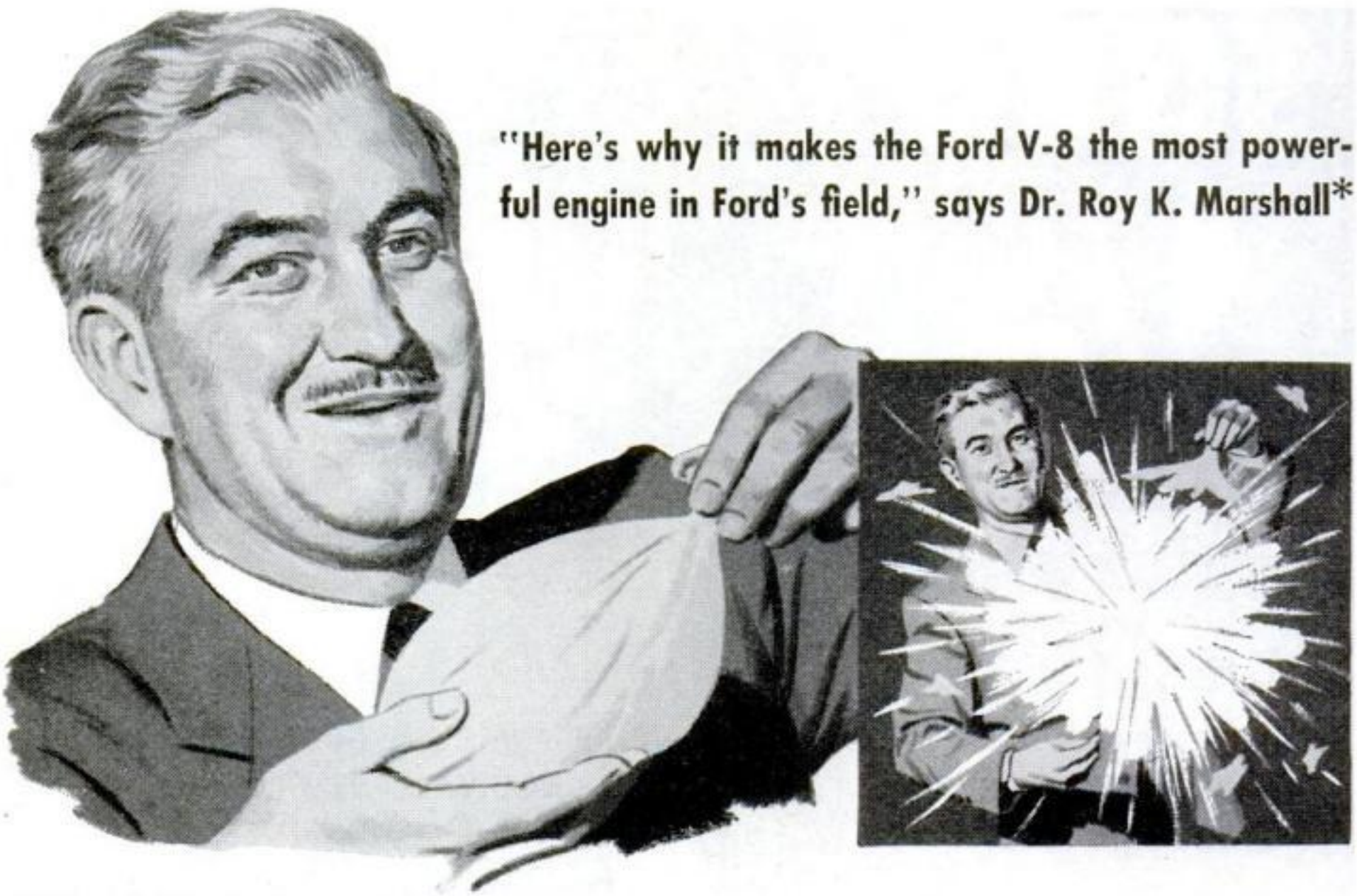
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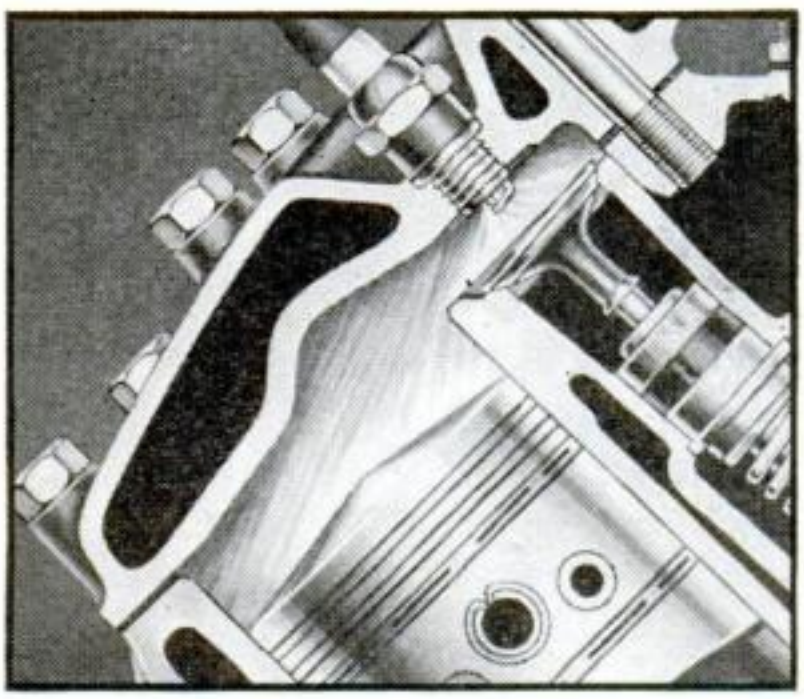
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# Higher Compression boosts



**"Here's why it makes the Ford V-8 the most powerful engine in Ford's field," says Dr. Roy K. Marshall***

**"When I fill a balloon with just enough air** so that its shape is filled out, I find pricking it with a pin causes the air to leak out slowly. Now if I take the same amount of air and compress it in a smaller space by squeezing the balloon, I find pricking it causes the balloon to pop. That's because the tiny molecules of air have been pushed closer together. When I pricked the balloon, in their rush to get out of cramped quarters they forced themselves through the hole much faster (and with more force, too)."



**"This experiment is a very simple explanation** of what we mean when we speak of the Ford Strato-Star V-8's higher compression. With Power-Contoured Combustion Chambers and new high-lift valves, Ford engineers have made it possible to feed gas more quickly into the cylinders and pack it in more tightly. This higher compression is the big reason for the greater horsepower in the 1952 Strato-Star V-8. And you get it with the economy of regular gasoline."

**Noted science editor, educator and TV commentator, Dr. Marshall is nationally famous for his simplified explanations of complicated things.*

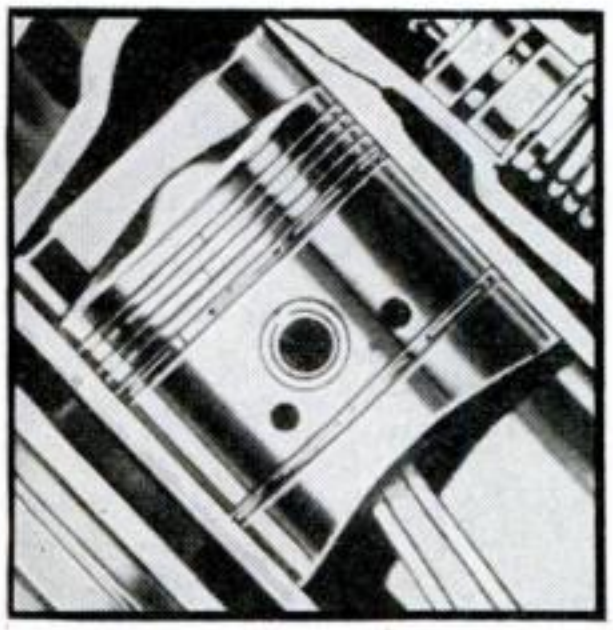


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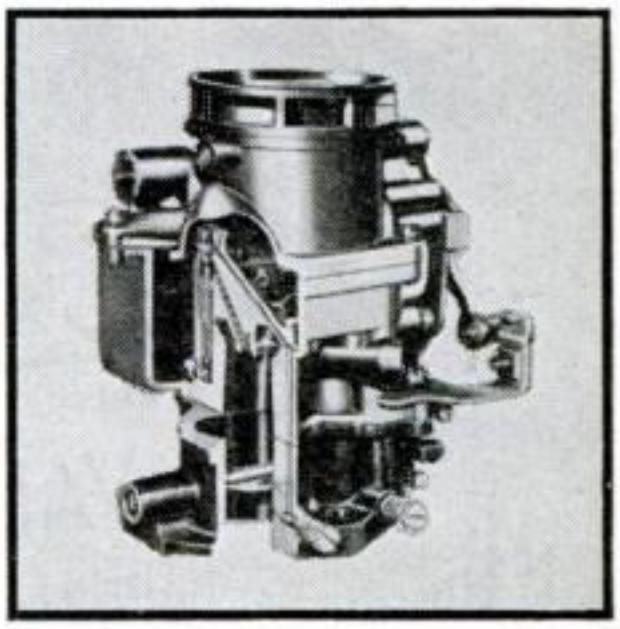
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## *Gus Pulls a Trick Play*

[*Continued from page 230*]

Gus didn't answer. He merely stared at the tank bottom.

It had come from the tank, that gummy business. But what? The gas showed nice and clean. Then he noticed that the gas tank had been patched. He stared at the soldered seams. And suddenly he had it.

"What happened to this tank?"

"Scraped something in the road a couple of weeks ago and picked up a gash in the bottom. The driver had the boys in the metal shop patch it up. Why?"

"Mr. Thompson, whoever did that patching job used an awful lot of solder on the seams. The soldering flux has been seeping out of the seams and mixing with the gas, getting as far as the fuel pump, then softening the coating on the diaphragm and creating that gummy stuff I showed you."

"Can it be fixed?"

"Sure. Let me put the pump to soak, and I'll tell you what to do."

He dropped the fuel pump into a pan of solvent, then took two cans off the shelf, made a mixture of the two liquids and poured it and the gas into the tank.

### *A Little Medicine for the Gas Tank*

"This is wood alcohol and acetone. It'll neutralize that flux. Just tell the driver to add a pint of each to every five gallons of gas. In a week or so, I think the flux will have worked out."

Gus finished up the job and looked at his watch. "Well, if you hurry, you can make the game on time. I hope you boys win."

Thompson paid up, shook Gus's hand and hopped into the driver's seat.

The rest of the day fell into its normal pattern, and Gus was closing up when the phone rang.

"This is Coach Thompson."

"What happened? You miss the game?"

"Heck no! Take a look at your evening paper, and see what one of your local news photographers found. You got a paper?"

"I think it just came. Hold the line."

Gus found the paper and turned to the sports page. In a four-column photo he saw the scoreboard: seven-six for Jefferson.

Gus picked up the receiver again. "Well, congratulations on your . . ." The photo caught his eye a second time. The rooting section—a card stunt—spelling out "GUS" in big, if somewhat ragged, letters. END

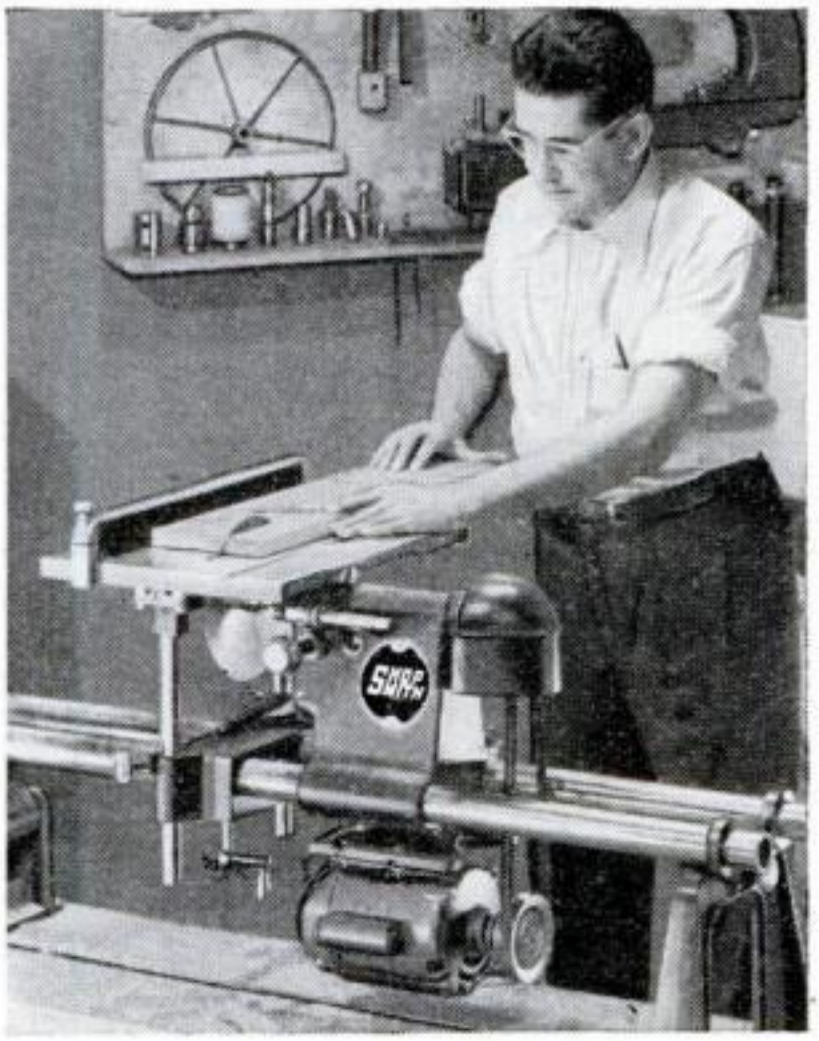
***Next Month: Gus and the dope runners.***



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**ENGINEER:** "Precision is my business. I checked SHOPSMITH from spindle tip to tail-stock before I bought mine. It's built with the kind of precision you'd expect to find only in the largest machine tools. That spindle tip, for example, is machined to a tolerance of .0002". And that's real precision!"

**EXPERIENCED WOODWORKER:** "In woodworking, there's no substitute for the *right* tool. And with SHOPSMITH, you always have the *right* tool for any sanding, sawing, turning or drilling job. I've replaced my single-purpose tools with SHOPSMITH. It does jobs I couldn't begin to do with my other tools."

**BEGINNER:** "I don't know much about woodworking—or power tools. But I'm learning fast with SHOPSMITH. It's plenty easy to operate, no complicated adjustments. It's safe. Above all, it turns out work that makes me look like an expert."

**CARPENTER:** "Most of my work is on big projects. No flimsy, bronze-bearing tools for me. Take SHOPSMITH, now. There's a tool with the kind of capacity I can use. It can do 1001 jobs too big or too heavy for most home workshop tools."

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## How Trees Make a House More Valuable

[*Continued from page 153*]

rows of trees, but one is probably all you have room for. Ask the weather bureau the direction of the prevailing winter wind and mark on your plan a row of closely planted trees at right angles to it. Put them far enough away from the house to leave a sheltered space. (If there are other houses close to you, they may divert the wind so that you get gusts from different directions. But you can find this out only by living in the house a while.)

Because a windbreak is needed most in winter, you'll want evergreens. Allow a six-foot-wide strip on your plan for one row. Some of the best trees are rather slow, so you may want to make a temporary outer wall of fast-growing, inferior trees, with a second, slow-growing row inside it.

Wind creates a difference in pressure that sucks heated inside air out around doors and windows. One test has shown that it takes as much fuel to heat a house when it's 32° with a 12-mile wind, as when it's down to zero with only a three-mile wind.

***Privacy.*** The same picture windows that let in the sun often put your living room in a showcase. Trees will give you privacy without cutting off light and air, as curtains do, and will often block traffic noise as well, which curtains don't.

Vision and sound both hit at a low angle, so low bushy trees are best for this job. If you want a year-round screen, use evergreens, but plant several varieties in an irregular row. This will also put a picture in your picture window instead of a view of your neighbor's trash cans.

Figure by experiment the angles of view you want to block, then mark your plan. One bush may be enough, or it may take a whole row. If possible, keep the trees well away from the window—you don't want to feel you're living in a jungle.

Tree walls can divide up your yard into its various use areas as well as fences can—and never need paint. If you like to rebuild old cars out in the yard, a tree wall will keep you and the missus both happy. If she wants a handy clothesline but doesn't like her scanties competing with the peonies, the tree wall will keep them private. If kids

[*Continued on page 238*]


# UNCLE WALTER

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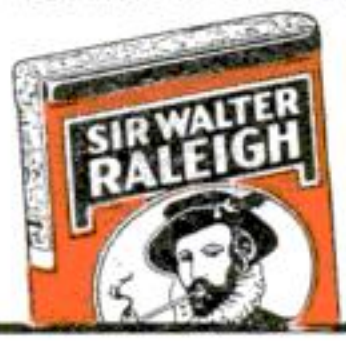
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## How Trees Make a House More Valuable

[Continued from page 236]

need a corner for sandbox and battered toys, a tree wall will conceal them.

This kind of division depends a great deal on your family's living habits. Better wait until you've lived in a house a year or so before you try it.

***Outdoor living room.*** A shade tree, a windbreak and a screen can be combined into an outdoor room. Keep in mind when you'll use it. For a snug corner to catch the sun in early spring and late fall, the windbreak is most important. But a place to drowse away a summer afternoon should be well shaded and open to the breeze.

If you want a floor to your open room, don't seal the ground with concrete or mortared flagstones. Your trees depend on ground seepage for their water. Put down a layer of gravel or tanbark that will let the water through.

***Play.*** Trees make wonderful playgrounds for children—natural jungle gyms, swing and trapeze supports, tree houses for young Tarzans. But unfortunately, kids grow a lot faster than trees. If the children are already on hand there's not much you can do except plant for grandchildren.

***Fruit and flowers.*** The common fruit trees can be grown at home, and they are relatively fast so you get a crop in a few years. Many varieties come in dwarf types that fit small yards. Remember that fruit trees need lots of care before they bear.

Flowers are easier to handle than fruit, even if they don't make such good pie. Although orchard trees do bloom, the showiest blossoms come from trees with worthless fruit. Some trees have handsome flowers but keep them only a short while and are rather homely the rest of the year.

Flower or fruit trees can frequently be used for screening, too, so keep that in mind in fitting them into your plan.

***Appearance.*** Many trees are planted just for what they add to the over-all appearance of the house and yard. Every house has its own problems. You may not be able to match the job of a professional landscape architect, but if you read up a little on the subject, use common sense and keep basic principles in mind, you can use trees to make your property more beautiful—and more valuable. Here are some pointers.

Careful planning is most important. Look at your house as objectively as a stranger

[Continued on page 240]



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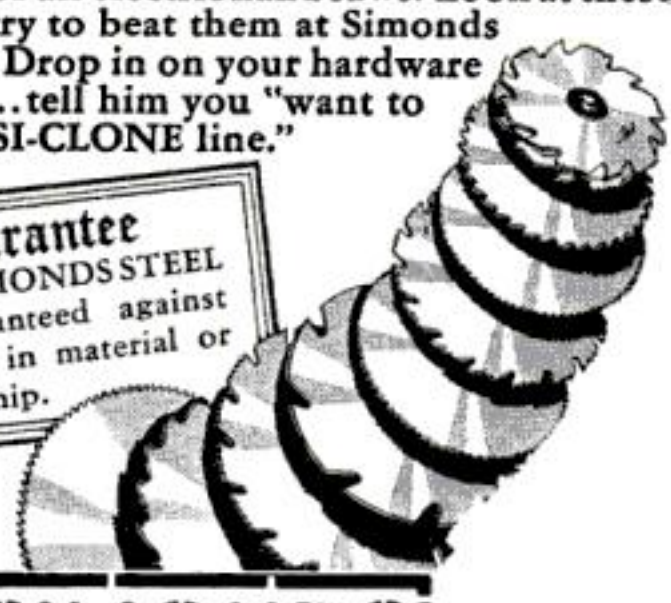
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## How Trees Make a House More Valuable

[Continued from page 238]

would. If it's too tall and narrow, trees planted out from the ends can make it look wider. A sharp bank at one end of the lot can be masked by planting. Houses perched on steep banks above the street need horizontal lines of low trees and shrubs.

Frequently shrubs are planted to hide the place where houses meet the ground. This helps older houses that sit up on high foundations. But with a new home set almost flush with the lawn the usual foundation planting often half hides the house and clutters the grounds. Above all, if you plant a tree close to the house bear in mind its future height. Too often a low bush becomes a sprawling giant that darkens windows and sends roots into cellars.

### *Too Many Is No Good*

Trees can also be used for emphasis—around doorways and walks for instance. But beware of planting too many trees. Make each one do several jobs. And remember that if you have a small house on a small lot, a big tree is going to look out of scale when it grows up.

One advantage of planning ahead is that you can do a little at a time as you can afford it and still not have a hodge-podge. One thing you'll have to decide right at the start is how long you're willing to wait after planting for your tree plan to develop. Good long-lived trees are usually slow growers. A tree that's already big is very expensive. A workable compromise is to buy the biggest trees you can afford; use inferior, fast-growing trees where you need the quickest results; and at the same time plant saplings of slower trees to take over later.

If you plan and plant with one eye on the future, you'll add dollars to the value of your property. The exact worth of one tree is hard to figure—one expert tells of a red maple that was variously appraised at nine different values from $75 to $389.83. But all experts agree that a sizable tree is worth more than it would cost to replace it. Real-estate men will tell you that it is easier to sell a house with attractive trees and grounds. In fact one famous firm recently suggested that a seller invest $75 to a $100 on a good tree before putting his house on the market! END

***Next Month: How to select the best trees for your house—which ones do which jobs, which ones are suited to your area.***

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## How I Learned Arc Welding

[Continued from page 207]

Either way, slant the rod 30° from the vertical in the direction it's going.

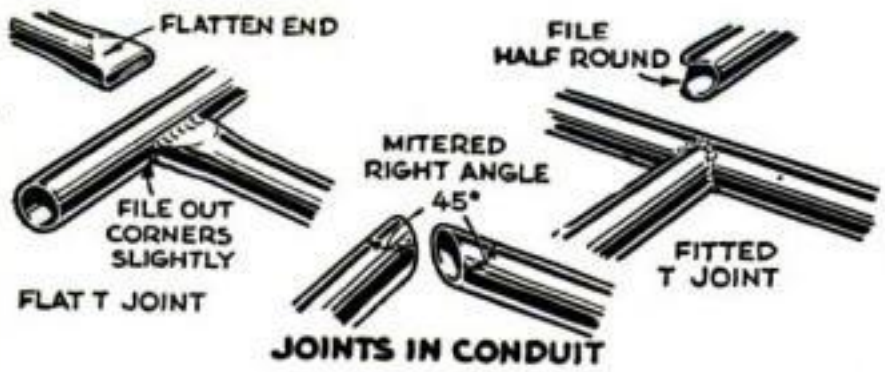
On heavy fillet welds, bevel the pieces to help the arc penetrate. If one bead does not fill the gap, or you want a larger fillet for strength, clean the slag off and lay a second bead on top.

Corner welds are the reverse of fillet welds. Place the parts upside down like a peaked roof, and weld across the ridge.

***Welding thin stock.*** The problem with sheet metal is burning through. Below 18-gauge (3/64") stock, use 1/16" rod and the low heat (32 amperes). For thicker stock up to 14 gauge (5/64"), use 1/16" rod and the next higher heat (42 amperes on my small welder).

Edges are most vulnerable to burning because the heat dissipates less readily than from within the sheet, and the arc hits the full thickness all at once. That's why a good fitup is critical with thin stock, and butt joints should be made with the edges touching.

A good joint for thin stock is the edge




weld. A short 90° bend in one piece is clamped against the other, and a bead run across the edges of both.

Thin-wall conduit, ideal for modern furniture, garden accessories, and toys, burns easily at the end. The lowest heat and 1/16" rod should be used. Start the arc on the through member of a joint, which has no edge to burn, and weave it across the other in short "takes." Once you get the edge covered you can switch to higher current for a smooth weld. The flattened T joint shown on this page is easier to make than the ordinary circular joint.

If you burn through, it is possible to weld the hole shut with a deft touch of the arc. Practice on short bits of conduit before tackling a job. The knockout slugs from electrical junction boxes can be welded into the ends of conduit furniture legs to keep from cutting cookies out of your rugs.

[Continued on page 244]



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The record-breaking success of the Hudson Hornet in strictly stock car competition in 1952—as well as in 1951—is a tribute to the handling qualities, ruggedness, dependability and safety in-built in Hudson's step-down design.

The car must be certified as strictly stock and identical with one you can purchase from your local dealer.

Here, as in all racing, Champion Spark Plugs are unchallenged for top performance and dependability. For not only have they been in the winning Hudsons, but in other victorious stock cars in many other events.

All of these cars, regardless of make or year, have used the standard type Champions recommended for that car. Here's solid proof that the Champions for your own car are tops in performance and dependability.

**CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO**






**Meet Mr. M. H. Toncray**
**Chief Engineer**
**HUDSON MOTOR CAR CO.**

*"CHAMPIONS have been standard equipment on our cars for over twenty years. We know we can depend on them for top performance on the highway and on the track."*

**HERB THOMAS**
**1951 Stock Car Racing Champion**
**Nascar Grand National Circuit**
*says—*

*"The Hudson Hornet I drive is equipped with regular stock CHAMPIONS, the same as those sold by your neighborhood Hudson dealer or service station."*

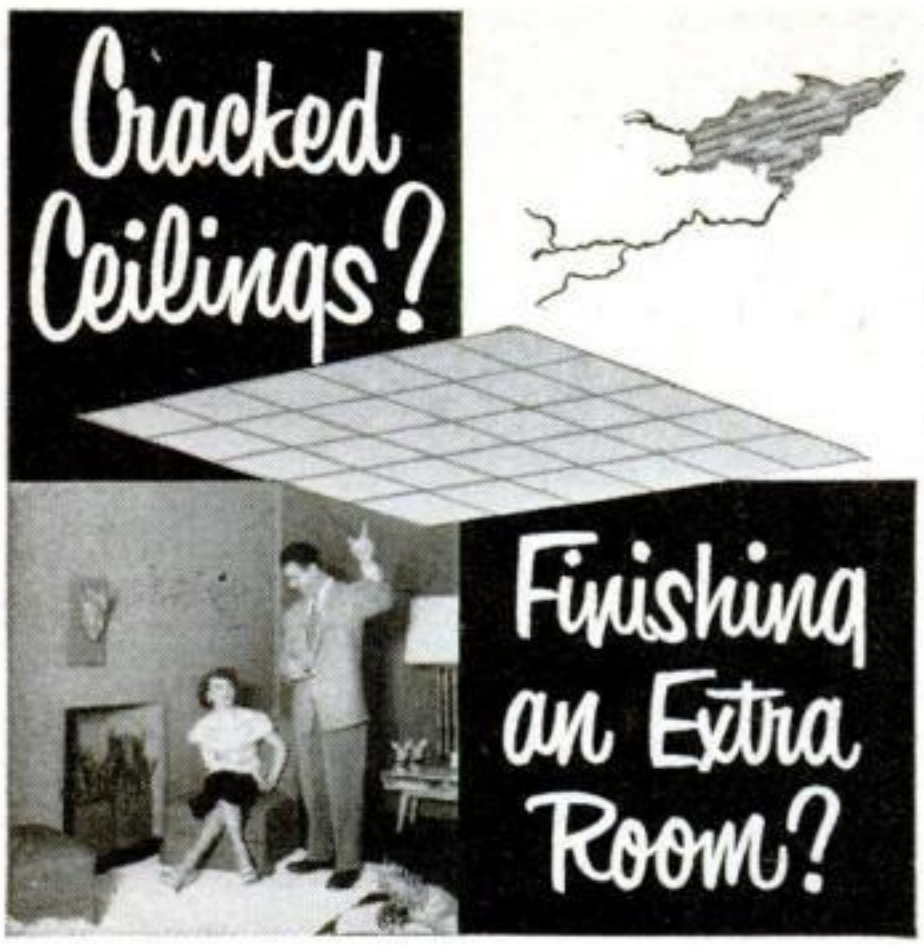


## *FOLLOW THE EXPERTS*

**USE THE SPARK PLUG CHAMPIONS USE**



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**YOU Can Apply Modern Ceilings Easily with**

# NEW UPSON CEILING TILES

***INSTALL THEM YOURSELF!***

*Re*-cover right over cracked plaster on 12" furring strips. In new construction, apply direct to joists. Positive, permanent application is quick and easy with color pins that match the neutral ivory finish. 6-ply laminated construction. Crackproof! For kitchen and bathroom ceilings, too.



***WASHABLE AND WATERPROOF!***

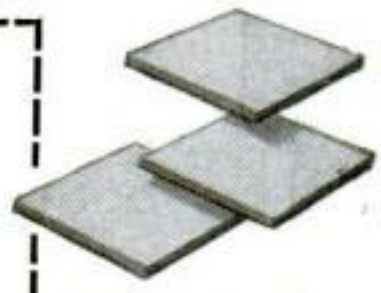


Syntho-surface coating proved by abrasion tests equal to two coats of aged oil base paint! Stands repeated washings! Even grease and oil spots can be removed with gasoline. Can be painted if you like—one coat covers. High insulating, light reflecting qualities! *Send 10c and coupon for idea booklet on home improvement!*

**THE UPSON COMPANY**
**3109 Upson Point, Lockport, N. Y.**

I enclose 10c for 32-page Idea Booklet. Include Instruction Sheet for applying Upson Ceiling Tiles.

Name_____
Street_____
City_____
State_____



UPSON Ceiling Tiles are 12" square and 3/8" thick with square corners, Shad-O-Beveled edges.


## How I Learned Arc Welding

[Continued from page 242]

***Holding work in position.*** Always clamp the pieces if possible. Often they can be clamped right on the welding table, with bits of metal or electrode stubs under them to maintain alignment. Vertical pieces can be held by clamping temporary braces to them. Spring clamps that you can apply with one hand will do wonders for your temper. Heavy blocks, old castings and the like come in handy as hold-down weights.

In a pinch, you can hold a piece with one hand and tack-weld it to another with a touch of the electrode here and there.

***Can't weld it? Braze it.*** Brazing resembles hard soldering, the "solder" being brass, the flux borax or a trade-named preparation. Brass rod with a flux coating is also available.

The carbon-arc torch that also plugs into your welder has sufficient heat to braze stock so heavy that it is beyond a small welder's capacity to weld.

The torch holds two pieces of carbon, which can be touched together to strike an arc. Connect one torch terminal to the ground tap on the welder and the other to a medium-current tap. Wear your helmet.

By varying the distance between the carbons, you can have a short intense arc or a long, cooler one. Use it like a torch flame to heat the work to any desired degree. Heavy pieces will take a considerable time to heat up, but small ones turn red almost instantly.

The parts must be cleaner than for welding. File or grind them bright. Position and clamp them and apply the torch. It's hard to see the work change color through the helmet, but watch for a moist or sweaty appearance of the metal. This indicates it is red hot and ready to take the brazing rod. Hold the rod in the arc until a droplet melts off. Then keep the arc on the work until the droplet flattens out and melts into the joint.

Other uses for the carbon-arc torch are preheating work for welding (which may enable you to handle jobs you couldn't otherwise), heavy soldering, and heating tools for hardening. END

---

### Miss-iles

WOMEN are a good deal like missiles. They can be classified as guided, unguided and misguided.—*Hy Sheridan in Flying.*



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# Advice to Ford Owners




WHEN YOUR FORD NEEDS SERVICE... **SPECIFY** THAT REPLACEMENT PARTS ARE **GENUINE FORD PARTS.**




THIS CERTAINLY MAKES GOOD SENSE BECAUSE WHEN **GENUINE FORD PARTS** ARE USED, YOU GET EXACTLY THE SAME QUALITY PARTS AS WERE USED TO BUILD YOUR FORD ORIGINALLY.

YES SIR! THEY'RE THE PARTS MADE EXPRESSLY FOR **YOUR FORD**. THEY'RE MADE RIGHT TO FIT RIGHT TO LAST LONGER!

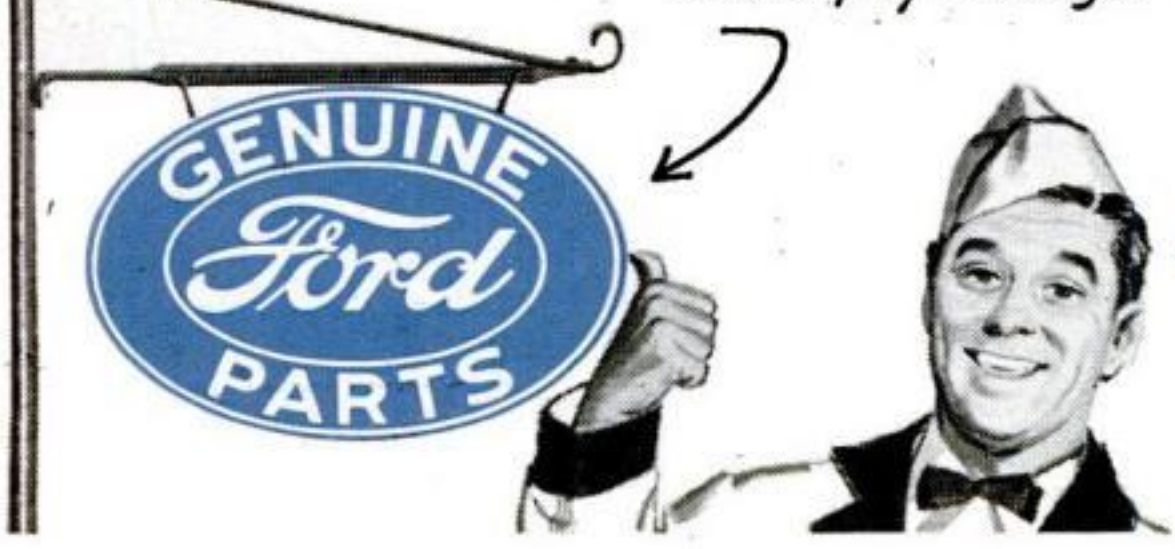



WHAT'S EQUALLY IMPORTANT... GENUINE FORD PARTS ARE TRACK TESTED IN ACTUAL ROAD DRIVING SERVICE... THEY'RE **QUALITY PROVED** BEFORE THEY EARN THE RIGHT TO WEAR THIS BLUE LABEL OF DISTINCTION.




## *P.S. to the thrifty*

*You'll save money, time and trouble by specifying Genuine Ford Parts. To be sure of getting them, always take your car for service to your Ford Dealer or to any of the selected independent garages that display this sign.*




**LET'S GET ACQUAINTED**



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## He Makes Shop Jokes Pay

[Continued from page 93]

and-egger ($100 a bout) when he got his nose broken in a fight and his wife made him retire.

Then Jim went to work as a machinist. He liked this work, and the men with whom he worked. But he also liked to draw—he had become a tattoo artist in his western days—and he indulged this hobby by taking a correspondence course in cartooning. He was on a night shift, and whenever he was waiting for a piece of work to come out of a machine (sometimes it took all night in those days) he drew cartoons.

### *Heroes Are Made, Not Born*

Just before the First World War Jim got a chance to make a career out of his drawing. He joined a local outfit planning to produce cartoon advertisements to be run in motion-picture theaters, and within three months was head of its art department. Then the war came along—and knocked the business flat. Jim was lucky to get his old job back with the Alliance Machine Co.

It was 1922. Jim was 33 and had a wife and two children. When he was laid off from the shop in a seasonal shutdown, he took a job as a coal heaver in a power plant. But he needed steady work. He was about to become a policeman when his son brought him a telegram while he was at work on the coal pile.

### *Not Genteel Enough*

The NEA Service in Cleveland, one of the largest newspaper-feature syndicates in the world, liked the cartoons he had submitted well enough to offer him a job drawing one for them every day.

"Out Our Way" first appeared on March 20, 1922. It wasn't a howling success. Some of Cleveland's more solid citizens complained that machinists were not fit subjects for the comic page. They were all for replacing "Out Our Way" with something more genteel. But many of Cleveland's 100,000 shop workers rose up and threatened to boycott the paper if it even *tried* to drop the shop cartoons—and they've been going strong ever since.

Though he lived in Ohio for many years,

[Continued on page 248]




**Go high, wide and handsome on the world's best motorcycle!**

HARLEY-DAVIDSON

HYDRA-GLIDE®









For the greatest sport in the world, spine-tingling thrills and pleasure-packed adventure, ride a Harley-Davidson. If you've ever broken a frisky colt, or hankered to, you know what we mean. You'll make the dirt fly at field meets, club events and endurance runs. You'll pal with the greatest bunch of red-blooded, fun-loving guys and gals in any sport. Go barreling along over highways and byways. Get going . . . see your dealer and take a buddy along. Or send 25 cents for illustrated literature and a copy of the ENTHUSIAST Magazine, filled with exciting action pictures and stories. HARLEY-DAVIDSON MOTOR CO., Dept. PS, Milwaukee 1, Wisconsin.




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**Only the new Millers Falls No. 966 Sander-Polisher**

# Does Them All



**$37.50** with 6" rubber pad, 6" lamb's wool bonnet, and three 6" sanding discs.

Additional accessories and attachments are available to save you time and money on hundreds of jobs.

- Buffing ✓
- Disc Sanding ✓
- Orbital Sanding ✓
- Drilling ✓
- Grinding ✓
- Polishing ✓
- Waxing ✓
- Mixing Paint ✓
- Wire Brushing ✓

Compare its uses . . . compare its price . . . compare its quality. You'll find no other power tool offers so much for so little. See it at your hardware dealer's or write for full details.

**Millers Falls Co. • Greenfield, Mass.**

MILLERS FALLS TOOLS
SINCE 1868

*The Mark of Superiority*



**It's a 6" Disc Sander and Polisher**



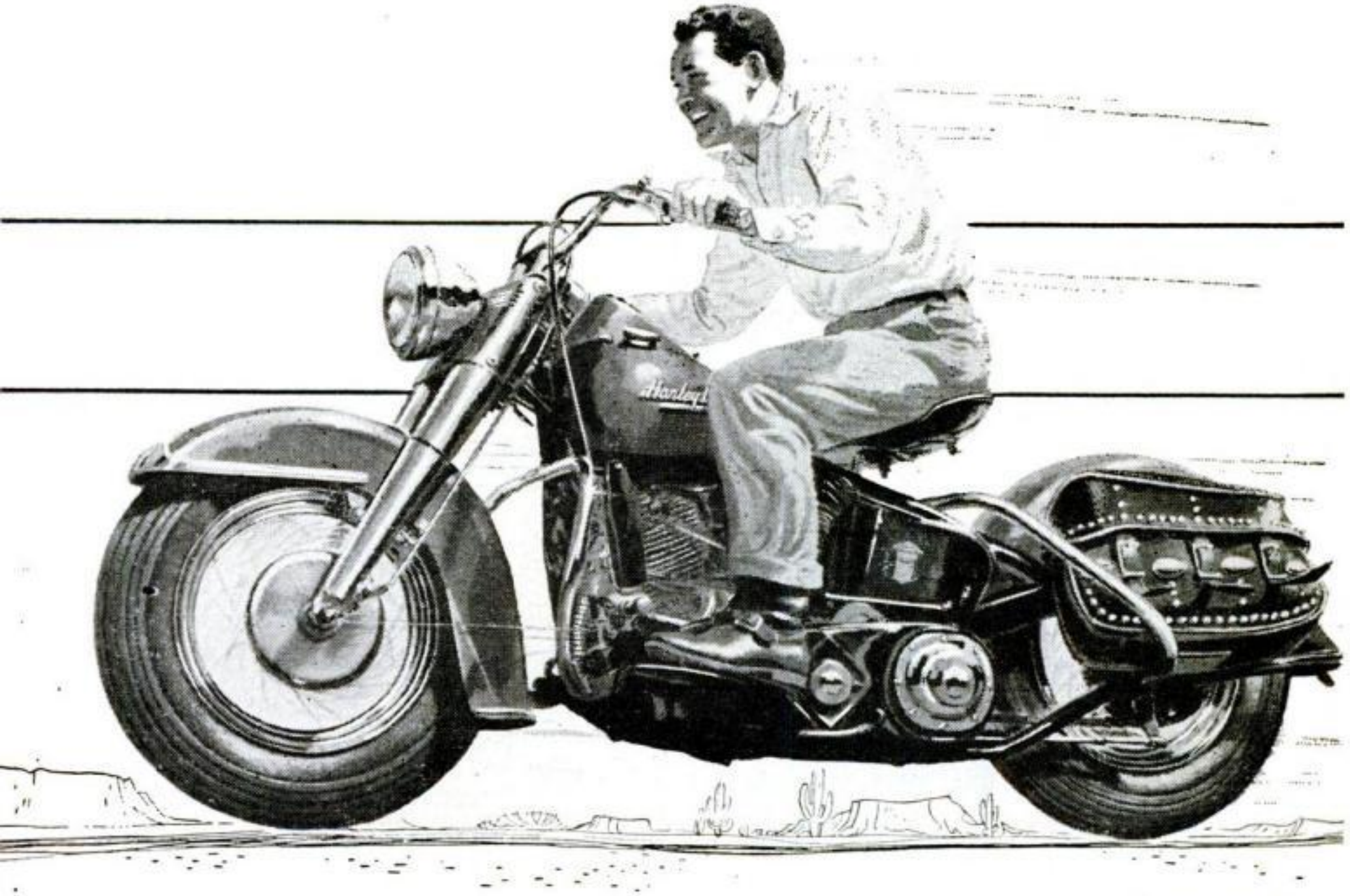
**It's a Fine Finish Sander with the No. 980 Orbital Attachment**



**It's a Bench Unit with the No. 9668 Stand**



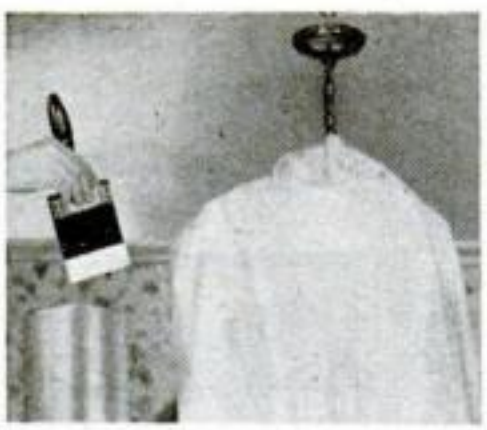
**It's a ¼" Drill with No. 9665 Jacobs Key Chuck**

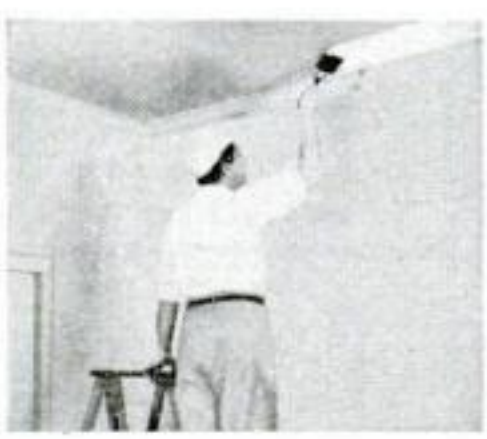


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## *Pointers for Home Painters* **Ceilings:**



Before painting, loosen base plate of lighting fixtures—drape with small cloth to prevent splattering. Don't overload brush with paint.



Stand on plank across two ladders. Start in corner. Dip brush to one inch. Raise quickly. Use short, light strokes. Paint in areas about four feet square.



Use a commercial hand protector, for quick cleaning of hands when job is done. Remove stubborn paint with thinner. Wash with soap.



For storage, clean brush thoroughly with thinner. Then scrub bristles with warm water and cleaner. Rinse in clear water, comb bristles and wrap in paper and store.

**JOB AFTER JOB you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles paint smoother . . . are clean and sanitary . . . never get brittle . . . don't break off even under the roughest treatment. And nylon bristles last from 3 to 5 times longer than ordinary bristles. Leading manufacturers make nylon paint brushes in all types and sizes. Look for the name NYLON on the handle. Be sure to pick the size brush designed for the job . . . and demand Du Pont nylon bristles.**

*150th Anniversary*

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living
*. . . through Chemistry*

The best brushes have
**DU PONT NYLON BRISTLES**

### He Makes Shop Jokes Pay

[Continued from page 246]

Jim Williams never outgrew his hankering for the West. In 1940 he bought a 45,000-acre ranch near Prescott, Ariz. It was a real show place, complete with a tennis court, a lake *and* a swimming pool. ("Imagine getting all this money for a little old cartoon!" remarked one of Jim's incredulous cowhands.) But it was a working ranch, too, with a couple hundred head of cattle. Jim Williams worked as hard as anybody on the place.

Jim sold the ranch in 1945, at the urging of his family, who preferred California. He was willing to admit, by then, that he wasn't making ranching pay. In fact, Jim is a natural soft touch. He probably has one of the largest collections of phony oil stock.

#### *Out His Way*

Jim Williams is now ensconced in a spacious Tudor mansion in ultra-respectable San Marino, just outside Los Angeles. Sometimes he's at work at his drawing board as early as six in the morning, wearing a moth-eaten, out-at-the-elbows, paint-spattered brown sweater, and looking pretty thoroughly out of place in his own heavily carpeted, paneled library.

Sometimes he sits at his drawing board all day long, smoking one cigarette after another, before he gets an idea for a cartoon; sometimes, on the other hand, he'll dredge half a dozen out of his memory and get them all drawn in a morning.

Then he heads straight for his shop in the garage, where he's always got some complicated project under way (a ship model, a piece of sculpture, a fancy doorstep, a garden fountain). This is a typical, cluttered shop—but there's one standard piece of equipment lacking; it hasn't got a single Williams cartoon on the wall. END

---

### Up a Tree

Two old coon hunters were swapping tall stories about their dogs. "Why," said one of them, "I had a yaller hound once and every time just before I went hunting I'd whittle out a board in the shape of a coon-hide stretcher, just to show him the size of the one I wanted, then I'd set it outside where he could see it. Well, sir, one day my wife set the ironin' board outside and that critter ain't come back yet!" —*The Santa Fe Magazine.*



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## Binocular THREE-DIMENSIONAL STEREO-SCOPIC MICROSCOPE

**$49.50 postpaid**

**Model X481**—prized in a myriad of fascinating studies and professions, the stereoscopic microscope is among the most interesting and useful instruments ever devised by science. Prismatic construction allows 3-dimensional micro-study of metal parts, gems, ores, minerals, watches and instruments, biology specimens (dissecting). Equipped with 10X paired achromatic eyepieces, choice of 2X or 5X achromatic objective lenses. Rack and pinion adjustments, milk and clear sided mirrors. Removable hand rests, fitted hardwood cabinet. Performance never before possible under $150 ..... $49.50 ppd.

**PAIRED EYEPIECES (4 SETS) $16.95 postpaid** Four extra sets of paired achromatic eyepieces (total: 8) for above instrument. See below for powers obtainable.

| Eyepiece power | 5X | 8X | 10X* | 12X | 15X |
|---|---|---|---|---|---|
| Obj. power 2X | 10X | 16X | 20X | 24X | 30X |
| Obj. power 5X | 25X | 40X | 50X | 60X | 75X |

*10X pair comes with instrument

## MICROSCOPE LIGHT $7.95 Ppd.



Professional model, Universal joint connects chrome and barrel-type bakelite head to solid, heavy base. Chromed fittings. May be used clear or with two special glass filters, blue and green. Complete with bulb, cord, two filters at no extra charge.

## 100 200 300 POWER Triple Turret MICROSCOPE $14.95 Ppd.



**Laboratory Model — The instrument that amazed biology instructors.** Excellent optical qualities, adjustment, solid construction. A lifetime bargain for students, schools, labs, amateur researchers. **Anyone can now own one!** (Performance cannot be duplicated for $75.) Uses: animal, plant and mineral research Study plant cells, microscopic animal life, crystal structure. See the complex anatomy of tiny insects, larvae, eggs. An absolute necessity in hundreds of fascinating fields. Shipped in hardwood cabinet.

**FREE CATALOG:** WORLD'S GREATEST VALUES IN QUALITY OPTICS. MICROSCOPES, ACCESSORIES, PREPARED SLIDES, MAGNIFYING GLASSES, LOUPES, BINOCULARS, EVERY ITEM A BARGAIN! SENT ON REQUEST OR INCLUDED WITH YOUR ORDER.

**MONEY-BACK** 10-DAY GUARANTEE ON ALL ITEMS. SEND CHECK, CASH OR MONEY ORDER. 20% DEPOSIT REQUIRED ON ALL C.O.D.'S. CALIF. RESIDENTS ADD 3% STATE TAX

# 40 TO 600 POWER

**15 Combinations! Professional**

## MICROSCOPE $29.95 Ppd.

*Model #635*



At last! The FIRST instrument with this range of performance ever offered under $125. Every feature needed for advanced university, pre-med and medical school use. Triple revolving turret containing 10X, 20X and 40X achromatic objective lenses. Achromatic condenser, 6-aperture revolving iris. Two-side plano and concave substage mirrors. Solid base, excellent precision construction. Complete with fitted hardwood case. With 15X eyepiece (giving 150X, 300X & 600X) less mechanical stage.

### SET OF EXTRA EYEPIECES $9.95 Ppd.

For above model #635 microscope. 4X, 5X, 8X, 12X interchangeable eyepieces in hardwood case, giving a total in all of 15 different powers from 40X to 600X. Complete set of 4 in case

### MODEL #400 MECHANICAL STAGE $14.95 Ppd.

Shown on model #635 microscope. Made only for this instrument. This is an optional accessory which allows you to move the slide microscopically right, left, up or down without touching slide. This calibrated stage cannot be duplicated for less than $45 (If microscope is ordered without mechanical stage, we will fit your instrument with fine spring steel, clip-type slide holders.) Shipped in fitted hardwood case.

*NAVY TYPE MARK XX*

## 20 POWER TELESCOPE $9.95 Ppd.



$30 value. Fine optically ground achromatic lenses, fully coated Same power as standard artillery observers spotting scope. Precision all metal construction Rust and salt spray resistant A valuable ship and boat owner's possession at a price everyone can afford Excellent scope for rifle range or hunting Shipped in choice of pigskin case or hardwood cabinet

*UNIVERSAL SWIVEL HEAD*

## SURFACE MICROSCOPE $26.95 Ppd.



Model #630 — 4 eyepieces included: 5X, 10X, 20X, 30X. A beautiful finely made instrument for inspection of GEMS, CRYSTALS, ORES, MINERALS, METAL SURFACES, MACHINED PARTS, FABRICS, STAMPS, COINS, BIOLOGY SPECIMENS (dissecting), ENGRAVINGS. For WATCH and INSTRUMENT REPAIR. Plenty of room beneath lens for fine work of all kinds. Swivel head allows allover inspection without moving object. Micro-focus adjustment at rear. Complete with removable hand rests, hardwood case and interchangeable eyepieces. Two sided mirror: clear and milk side for anti-reflection. A $100 value

**the AKRON** 4400 SUNSET BLVD. LOS ANGELES 27, CALIF. OPTICAL DEPT. 9-S



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*MORE CREATIVE* with
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Creative hands can be your greatest asset . . . X-acto knives and tools help the intelligent coordination of active minds and agile fingers . . . they can develop skill and dexterity in any art or handicraft you select.



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## *Lithium, the H-Bomb Metal*

[*Continued from page 114*]

be recovered by decomposing the water with electric current.

Although lithium was discovered as early as 1817, by the Swedish chemist J. A. Arfvedson, only a few uses for its compounds were known until recent years. World War II spurred the development of many.

In submarines, the U. S. Navy found, lithium hydroxide purifies the air by absorbing carbon dioxide—the dry white powder is sprinkled over tarpaulins for this purpose. Alkaline-type storage batteries used in submarines and in mines employ an electrolyte containing the same compound.

Lithium hydride, like the metal itself, reacts with water to liberate hydrogen. In World War II, it made a convenient lightweight source of hydrogen for inflating observation balloons and radio-antenna-carrying balloons for life rafts.

### *You Drink It, Too*

Many uses of lithium compounds, old and new, come closer to home. You drink lithium citrate and chloride in beverages, and may take other lithium compounds medically. Household air conditioners, as well as industrial types, now dehumidify the air with the aid of lithium bromide or lithium chloride. These salts have the remarkable power of extracting moisture from air, even when they are already dissolved in water to form a brine used as a spray.

Quite likely the gay colors on your glassware and pottery were put there with lithium-containing enamels and glazes, which offer a wide range of hues, including rich tones of blue and red. Porcelain enamel containing lithium is used on bathtubs and refrigerators, and has lately become the standard kind for kitchenware, giving superior gloss, resistance to heat shock, and freedom from staining. In varnish, a lithium compound serves as a "flattening agent."

### *Makes New Laundry Bleach*

Combining soaplike lithium stearate with lubricating oil yields the "wonder" grease mentioned earlier. But if you combine lithium stearate with paraffin instead, you get a new family of useful waxes, with the desirable qualities of more expensive kinds.

Called "lithowaxes," these new materials show great promise for use in products as varied as cosmetic creams, phonograph rec-

[*Continued on page 254*]



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# weekend remodelers...

You too, can transform your floors and give them sparkling new beauty with these life-time *Hako Inexpensive Luxuries!* HAKO Vinylflex Plastic Floor Tile and HAKO Asphalt Floor Tile are extremely easy to install. Your HAKO dealer will help you decide on the type of floor you need and will furnish self-installation instructions or quote on an installed price.

look what you can do in YOUR home!

GREASE PROOF
QUIET UNDERFOOT
LESS WEAR — EASY CARE
13 BEAUTIFUL COLORS
COLOR THRU — NO BACKING

HAKO Vinylflex T.M. PLASTIC FLOOR TILE

*Trade Mark Applied For



THE ALL PURPOSE PLASTIC FLOOR TILE

DOWNRIGHT DURABILITY
ECONOMICAL
29 COLORS
PARQUETRY DESIGN

HAKO Asphalt Tile



AN INEXPENSIVE LUXURY FOR FLOORS

SPARKLING COLORS
INEXPENSIVE TO INSTALL
POSITIVE WATERPROOF PROTECTION
DEEP BEVELED EDGES
EFFORTLESS TO CLEAN

HAKO Coronet ®

Guaranteed by Good Housekeeping



THE WATER-PROOF PLASTIC WALL TILE

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PITTSBURGH 13, PA.

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Please send me illustrated literature and installation instruction booklets. Enclosed is 10c to cover cost of handling and mailing. I am interested in

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Coronet Title is designed for easy *self-modernization*. Coronet creates an amazing change in the appearance of bathrooms, kitchens and powder rooms. The water-proof flange on the wall side of Coronet makes it the ONE safe tile to use in tub recesses and shower stalls. Your HAKO dealer will help you select color and give you self-installation instructions or, if you prefer, install your Coronet at nominal cost.





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# New car polish called Plasticote astounds car specialists

## *Photographer's model turns grime-covered car into glistening beauty in 37 minutes at cost of only 46 cents*

**PLASTICOTE** with Kelvex is a liquid plastic, not a wax —can be applied in bright sunshine. Smooth, glass-like surface, resists dust and grime. Makes polish last longer.




**"NO WASHING!"**—she emphasizes as she rubs I C U PLASTICOTE on easily and quickly, adding, "It loosens dirt and grime as it deposits a plastic, glass-like coating on the car."




**MODEL EXCLAIMS:** "Beautiful, isn't it!" and points out PLASTICOTE'S three advantages over wax polishes —*One*, you don't need shade—*Two*, you don't have to wash your car—*Three*, you don't have to rub hard. I C U Plasticote cleans, coats, polishes, and protects in one easy operation.




**TIME-JUDGE ANNOUNCES:** "That took you just 16 minutes" as model smiles and accents the fact that there was no hard rubbing or great effort involved.

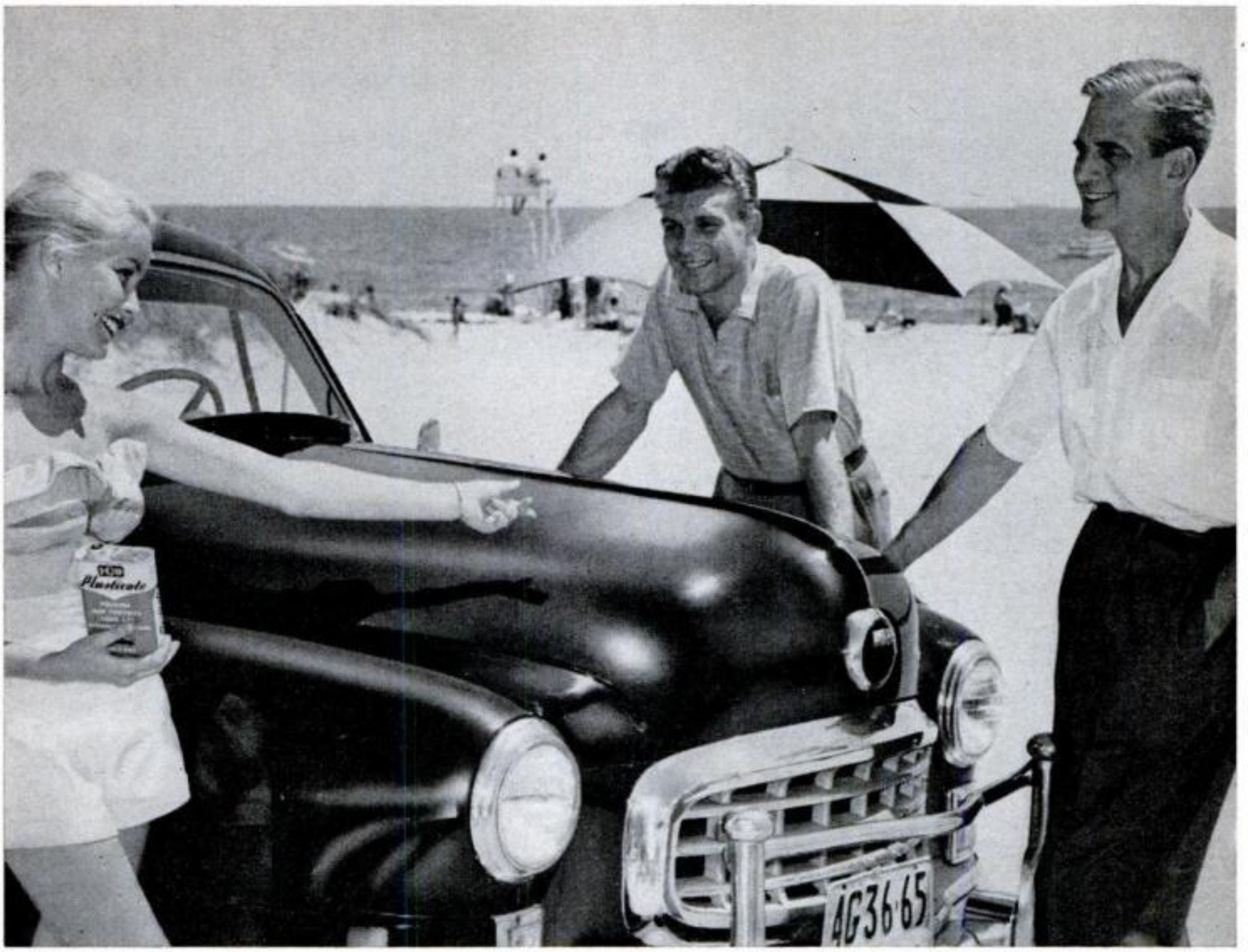



**"FINISHED IN 37 MINUTES"** announces the Judge. Model points out that she used just about ⅓ of a can of PLASTICOTE. Note: *Checking disclosed she used exactly 46 cents worth.*

This product is sold in California under the Trade Mark of **ICU AUTO POLISH**



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"PLASTICOTE outsells all other polishes, bar none." *Warren's Amoco Service, Vero Beach, Fla.*



**BRING BACK THAT NEW CAR LOOK!** Get PLASTICOTE with Kelvex at your favorite filling station, auto supply store, or car dealer. If no dealer nearby, use this easy order coupon.




**Enough for three cars $1.25. Keep your car beautifully polished for one whole year!**

I.C.U. PRODUCTS OF THE LIVINGSTON COMPANY
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PLEASE RUSH ☐ PINTS I.C.U. PLASTICOTE POSTPAID AT $1.25 PER PINT. I AM ENCLOSING $.....

☐ SEND ME FREE LITERATURE ON THE NEW I.C.U. PLASTICOTE.

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The NEW Model 50 UTILITY TESTER

FOR REPAIRING ALL ELECTRICAL APPLIANCES-MOTORS

an all-around electrical trouble shooter



- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, etc.
- Will measure the current consumption while the appliance under test is in operation. The appliance or utility may be plugged directly into the front panel receptacle. A special pair of insulated clip-end leads is included for motors, etc.
- Incorporates a sensitive direct-reading resistance range which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range will enable continuity checks and tests for shorts and opens.
- Will test thermostats, radio tube filaments, bulbs, fuses, fluorescents, condensers, switches, field coils, circuit breakers, lighting systems, etc.

Handsome round cornered molded bakelite case 3⅛" x 5⅞" x 2¼". Complete with all test leads and instructions.

$13.90

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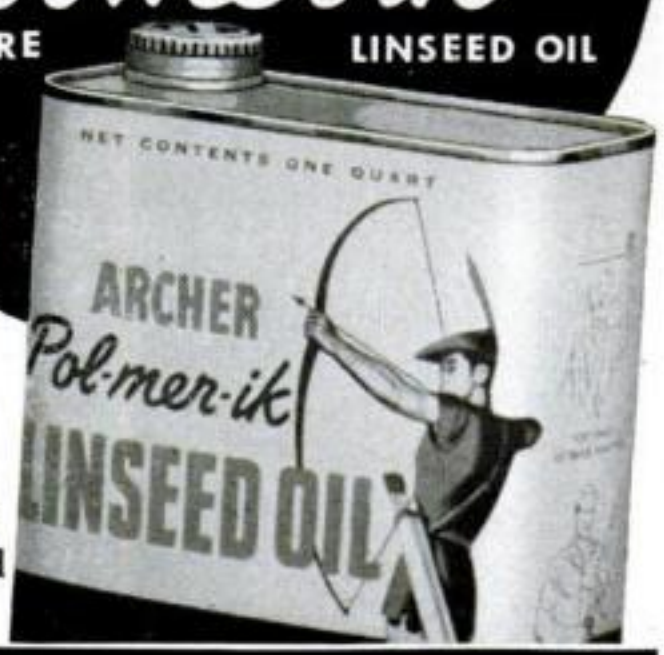
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## Lithium, the H-Bomb Metal

[Continued from page 250]

ords, crayons, wax paper, candles, polishing waxes and printing inks. One firm that makes lithium chemicals has successfully printed entire issues of its company magazine with ink containing a lithowax.

A year or so ago, the same company showed publicly for the first time a small watertight envelope of white powder beside a gallon jug of commercial liquid household bleach. The powder in the small envelope, lithium hypochlorite, had as much bleaching action as the big jugful of liquid. It is expected to be made available soon to housewives.

### *Flame Color Useful*

New welding and soldering fluxes, especially suited for welding aluminum, employ lithium fluoride as an oxide scavenger and metal cleaner. Large transparent crystals of the same lithium compound are shaped into lenses and prisms for optical instruments and transmit a wider range of ultraviolet rays than any other substance known.

Recently developed "ferrite" magnetic materials, of which the television industry alone now uses 100 tons monthly, include a promising lithium-containing type called a lithium ferrospinel.

For many years, lithium compounds have been used in pyrotechnics for signal lights, imparting a characteristic carmine-red color.

Emphasizing official interest in discovering new sources of lithium, government geologists have joined in the hunt for it. And as this issue goes to press, word comes that the Defense Production Administration has set a production rate of 10,000,000 pounds a year of lithium compounds. Scheduled to be attained by the beginning of 1955, this expansion would multiply the output of the four years ending January, 1951, by as much as 2½ times. END

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### Juvenile Science in the Kitchen

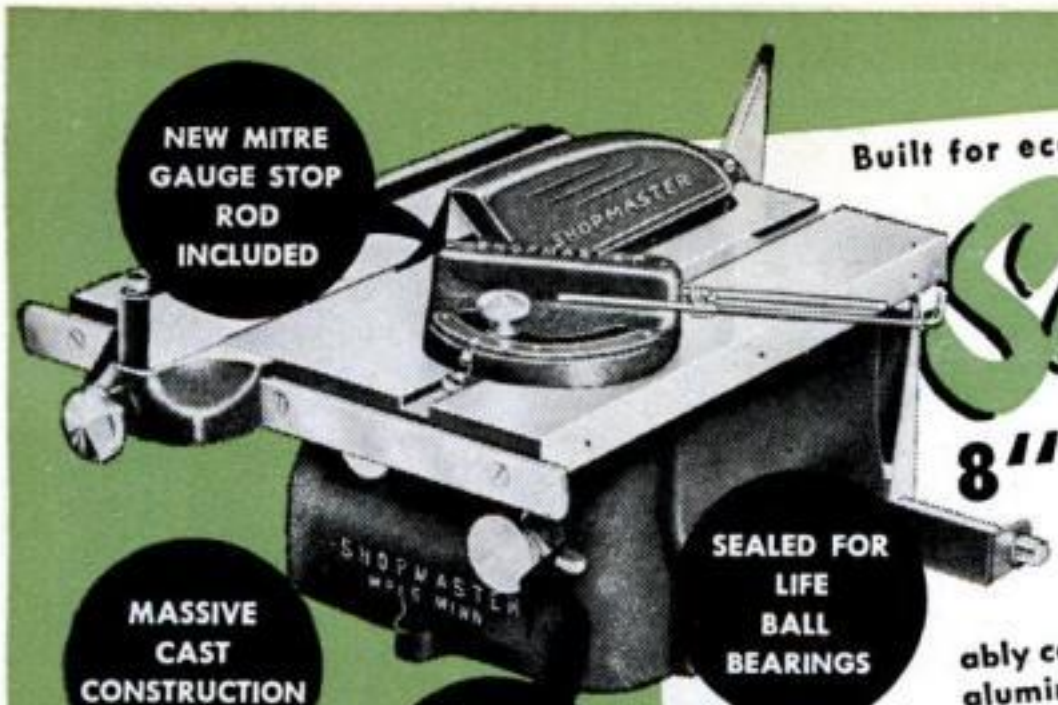
A COUPLE called away by an emergency gave their son detailed instructions about cooking and cleaning. When Pa and Ma returned they found everything spotless except the big cooking kettle.

"Why didn't you wash the kettle?" asked Ma.

"Because," said the boy, "you always told me a washed pot never boils."—*Boston Globe.*



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## 8" TILTING ARBOR SAW

A new Shopmaster tool at a new low price. Durably constructed of rugged cast aluminum alloy with large table working surface. Has visible and convenient operating mechanism. It's an excellent all-around tool for the new hobbyists' workshop.

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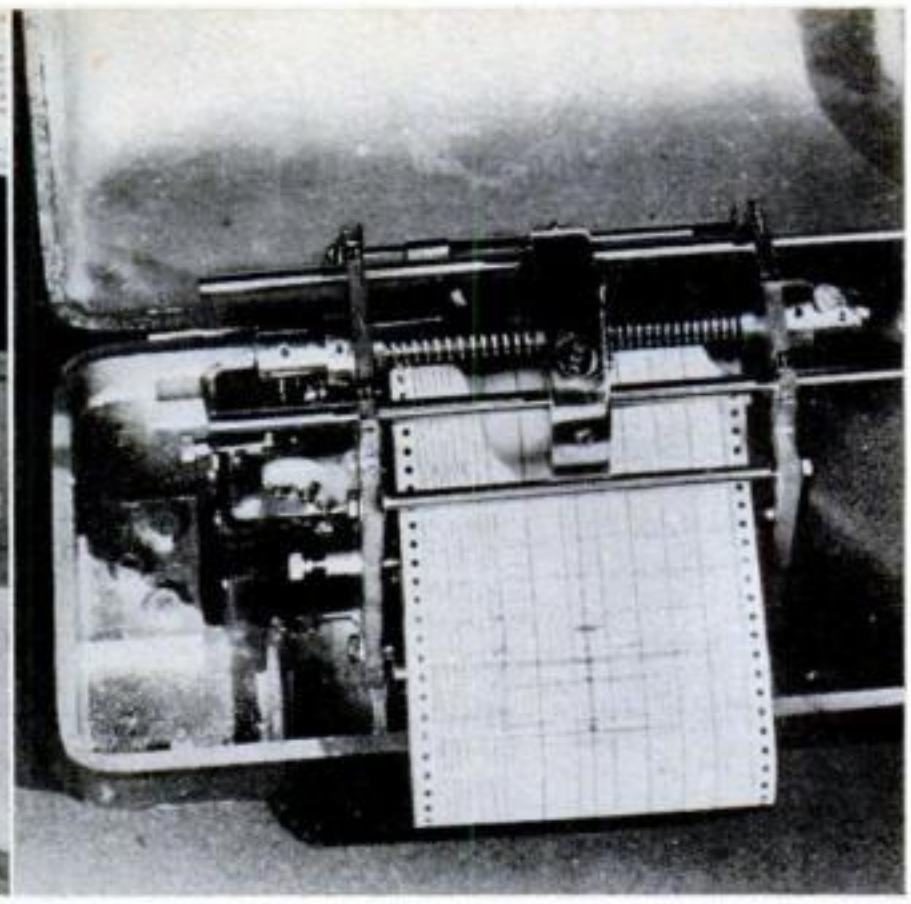
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## Rough Rides Show How Much Crates Can Take

CRATED refrigerators, stoves, and other products are really taken over the bumps at the Porcelain Enamel Institute, at Washington. D. C. They ride a mechanical obstacle course to find out how packaging will stand up under a real journey by truck and rail. Undergoing an impact test, a crate, above left, is pulled on a dolly up an incline to a predetermined point where it will be released and allowed to roll back and slam into the bumper at the bottom. Attached to the lower left-hand corner of the crate is a shock recorder, shown close up at right above, that measures the amount of impact.




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**SYNCRO SANDERS DO MORE WORK PER SQUARE INCH OF SANDING PAD SURFACE THAN SANDERS COSTING TWICE AS MUCH.**

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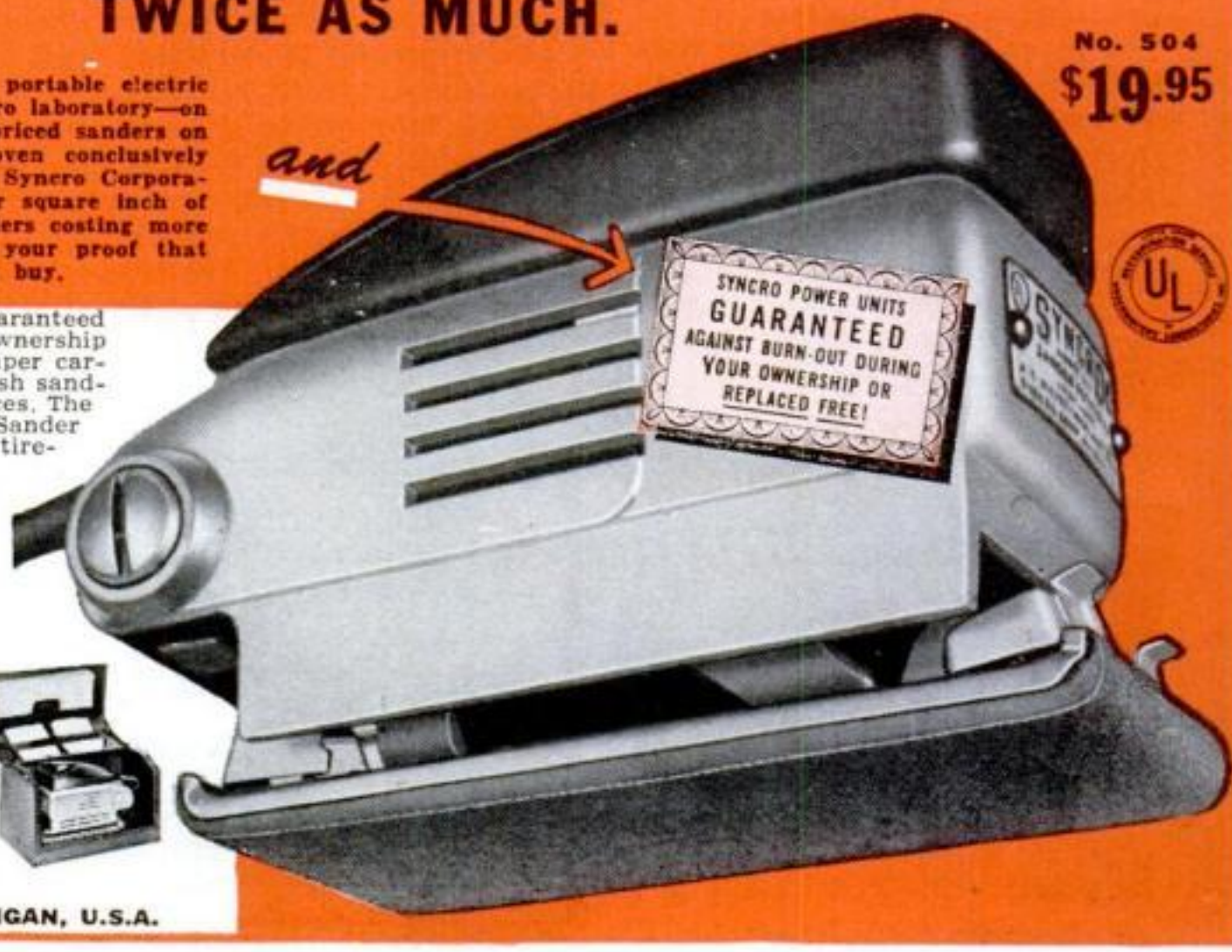
Sturdy 9"x5" metal case holds "504-D", 10 sandpapers, polish pads, cord. At Hardwares or postpaid ..... **$22.95**

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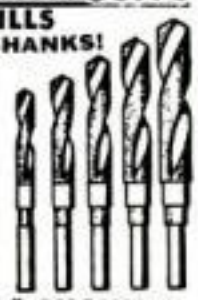


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Sizes available—letter size C, fraction size 3/16", number sizes 2, 5, 10, 12, 13, 18, 40 & 50. 12 of any one size, doz. **$2.15**

12, any mixture of your selection of above sizes ..... doz. **$2.35**
NOTE: Min. order, 1 doz. Large quan. available at further discounts.

**SET 7E** 12 different size H. S. straight shank Drills, 1/4" to 1/2", lengths up to 7". Only..... **$3.98**

**HIGH SPEED DRILLS**
**1/2" TO 1-3/16" WITH 1/2" SHANKS!**



**SET 35E** 6 different size H. S. Drills, 1/4" to 17/32" all with 1/4" shanks, PPD..... **$2.98**

**SET 36E** 10 of above, PPD..... **$4.95**

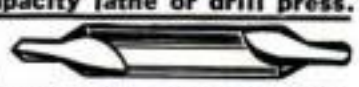
Sets 35E and 36E will fit any 1/4" drill.

**HIGH SPEED DRILLS**
**1/2" to 1-3/16" WITH 1/2" SHANKS!**
5 Drills for less than the price of one new Drill!

**SET 32E** 5 different size H. S. Drills 1/2" to 1-3/16"..... **$7.95**

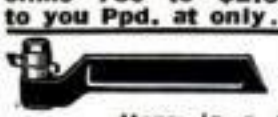
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These new and used H. S. precision Drills with 1/2" shanks can be used in a 1/2" elec. drill or a 1/2" capacity lathe or drill press.



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Here is a tool that will do the work of a left, right and straight tool holder, plus a boring bar, all for a fraction of its original cost. PPD to you.
TOOL A takes a 5/16" sq. bit or 5/16" dia. boring tool. Shank size 9/16"x1"x4 3/4". PPD. Only..... **$3.29**
TOOL B takes a 3/8" sq. bit or 3/8" dia. boring tool. Shank size 5/8"x 1-3/16"x5 3/4". PPD. Only..... **$3.95**
TOOL C. Cut-off blade holder for 3/32"x3/8" blade. Shank size 1/2"x1"x4 1/2" (can be changed to fit other size cut-off blades). PPD. Only..... **$2.25**
TOOL BIT SPECIAL: 12 H. S. 3/16" sq. x 2 1/2" new tool bits. PPD..... **$1.95**

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**SET 34E** 6 Different Size High Speed Slitting Saws, 5 pcs. 2 3/4" dia. x 1" arbor, plus 1 pc. 5" dia. x 1/2" arbor—thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" elec. drill. $25 value. PPD. Only..... **$4.95**

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**SET 18E** 15 Different Size High Speed Straight Shank Chucking Reamers from 1/4" to 1". New and used. Priced at only **$7.95**

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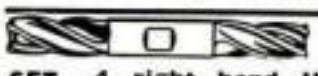
7 different pcs., High Speed 1/4" shank, PPD. **$4.49**

**SET 22E** 14 different pcs. as above, PPD. **$8.79**

**HIGH SPEED WOODRUFF KEY SEAT CUTTER**



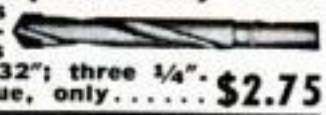
**SET 4E** 5 different size cutters. Can be used as mounted milling cutter or circular saw. All with 3/8" and 1/2" shanks, widths up to 1/4", dia. up to 1". New and used. Ppd. Priced at only.... **$3.95**



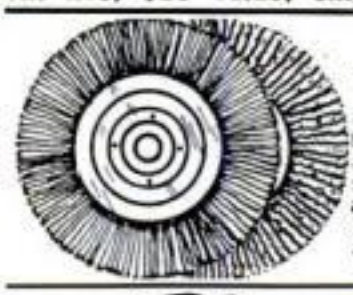
**DOUBLE-END END MILLS**

**SET 29E** 4 right hand H. S., 3/8" straight shank End Mills up to 3/8" dia. ..... **$3.98**

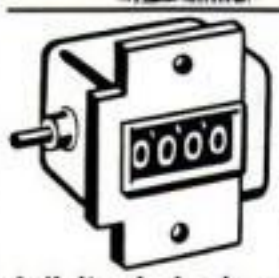
**New Carbide Tip Masonry Drills**



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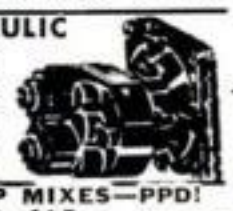


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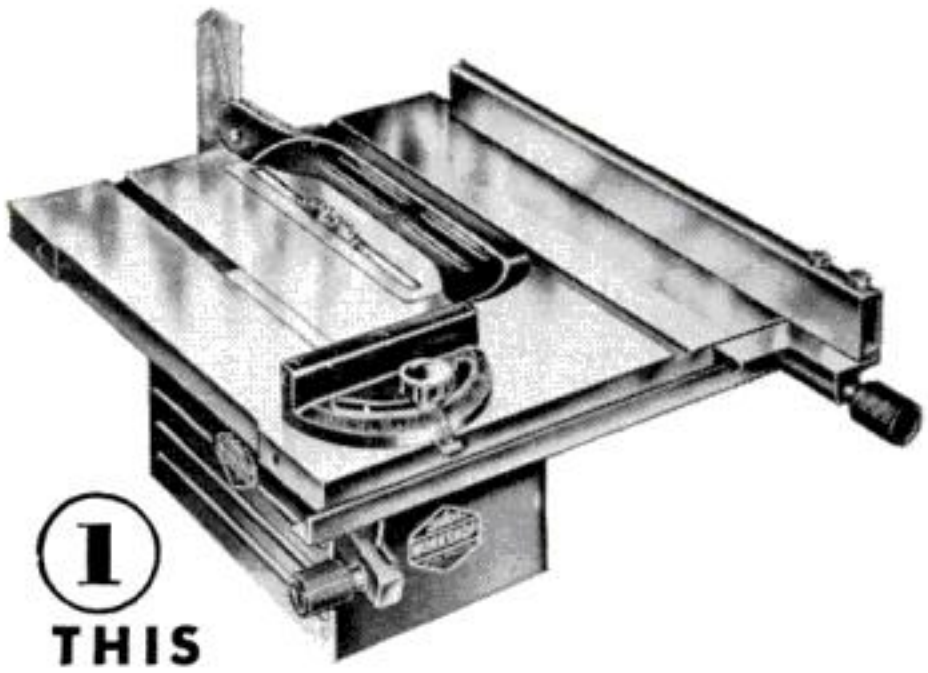
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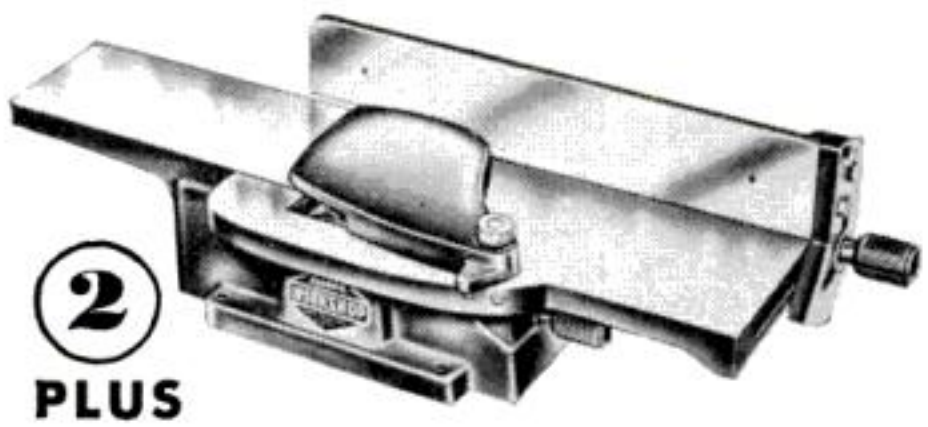


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Atlas DEPENDABLE QUALITY TOOLS SINCE 1911


## *TV Tricks Take You Space Traveling*

[*Continued from page 108*]

ing more than a baby alligator. With a crest of paper spines taped to its back, it was placed on a sloping sheet of glass. The camera shot a relatively big image. Blended with a picture from another camera shooting over the pilot's shoulder, this produced as neat a visual nightmare as any TV addict could ask.

We haven't invented a tractor beam yet, but some invaders from space used one in *Out There*. An invisible beam swept across earth like a controlled cyclone, sucking animals, trees, soil and houses into the air. Producer John Haggott had a miniature landscape built with a trench running through it. The bottom of the trench was covered with screening, and the trench filled with chopped cork. Miniature houses, trees, and animals were placed over this. When a CBS prop man moved an air jet under the trench, things flew skyward.

### *A Lobsterscope Is a Glockamora*

Space ships in the same show were big cardboard Easter eggs, suitably painted and fitted with eyelets to slide down taut wires strung before a black backdrop. Inverted by a prism before the camera lens, the picture showed the ships shooting up. When attacked by Earth's defenders, they obligingly exploded. Flashlight powder and a tiny detonator in each did the trick.

The effect of light from rocket blasts, or of shimmering reflections from water, is produced by rotating a perforated disk in front of a spotlight. Called a lobsterscope in ABC studios, it's the glockamora to CBS.

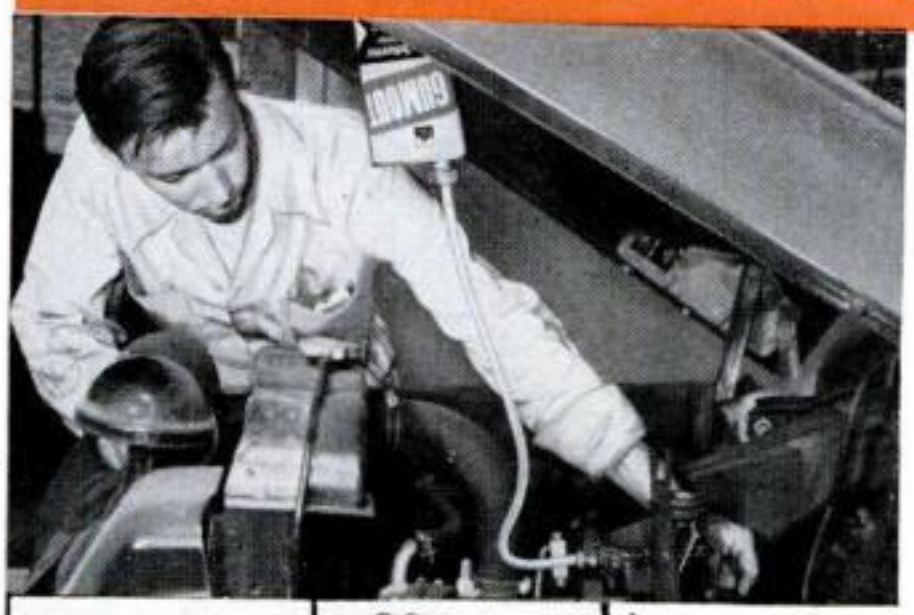
But tell the kids that dinosaurs are only eight inches long, that boiling mud is the same stuff mother serves for breakfast, and they'll only nod before turning back to the show. Because in science-fiction TV, it's fun to be fooled.—*Harry Walton.*

---

### Why Waste the Aroma?

VISITING a professor recently, we noticed a lighted Bunsen burner under a tripod on which a cigar butt was perched. There was little but ash left, and we remarked that the "lighter" had done too good a job. "Oh, that," said the professor. "I like to smoke cigars until they start to taste bad. Then I put them on the tripod for the burner to finish because I like to smell the smoke."—*Chemical and Engineering News.*

# How to clean CARBURETORS "on-the-engine"



A lot of time and money is wasted checking timing, adjusting spark plugs, replacing points—even making major replacements—in an effort to correct engine troubles curable only by carburetor cleaning.

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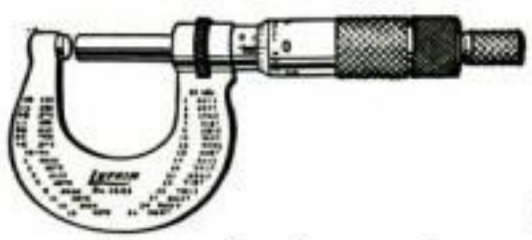
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300 Watt 110-220 volt AC. Wgt. 40 lbs—portable **$99.**
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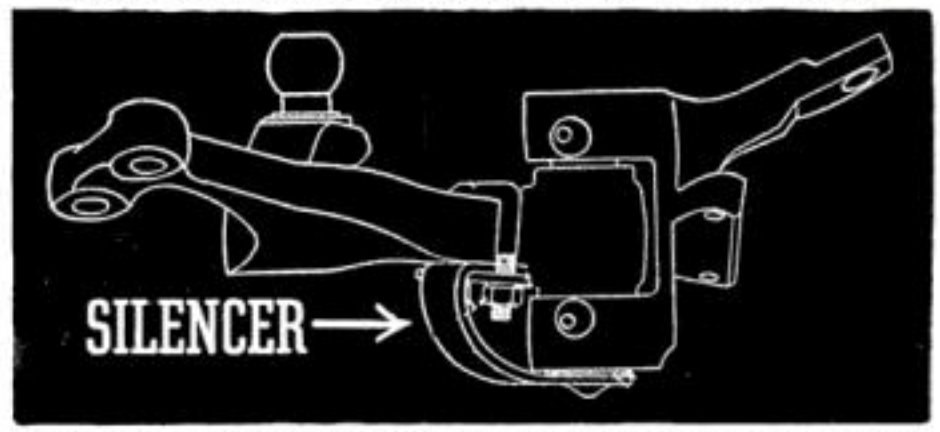
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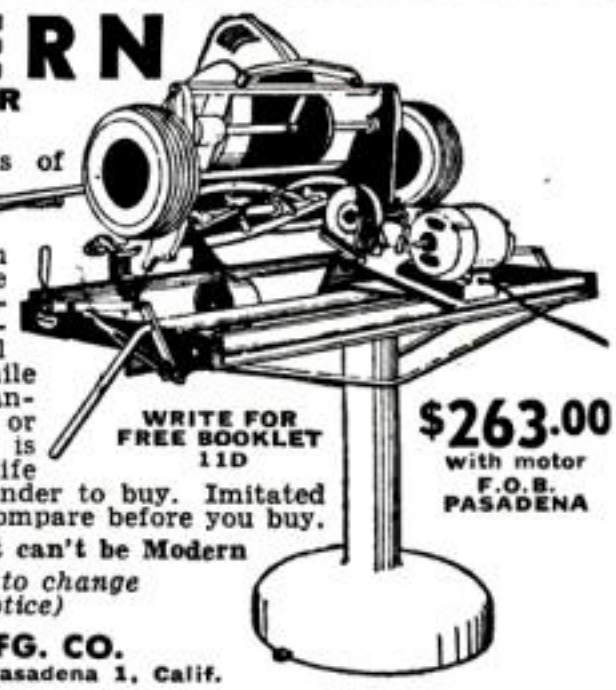



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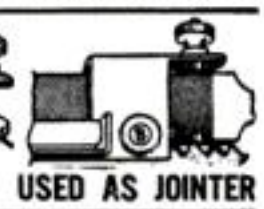
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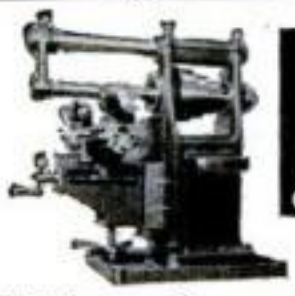
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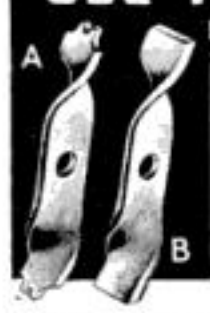
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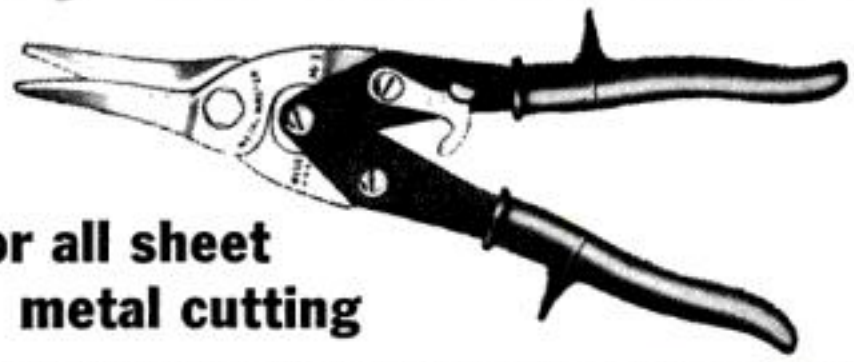
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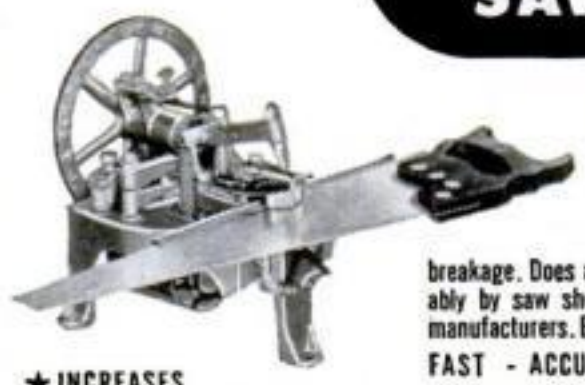
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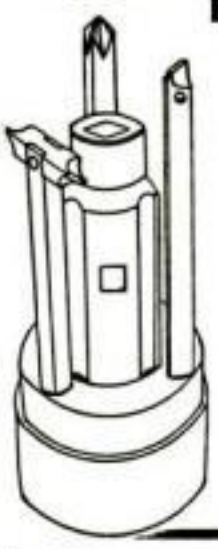
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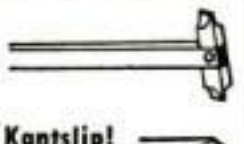

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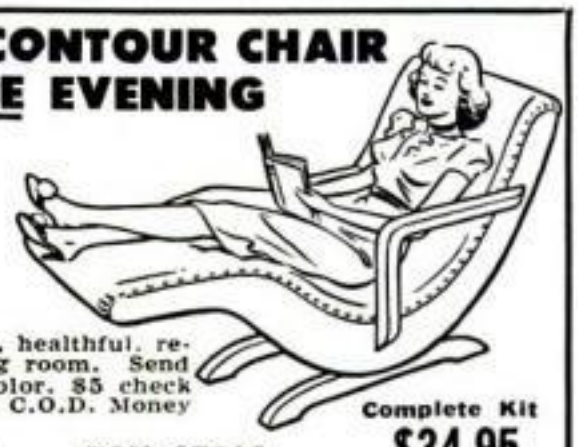


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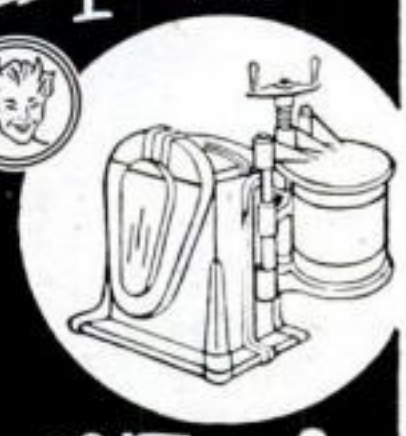
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By Earl P. Taylor

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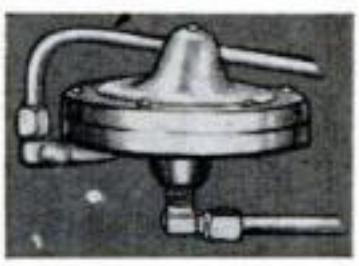
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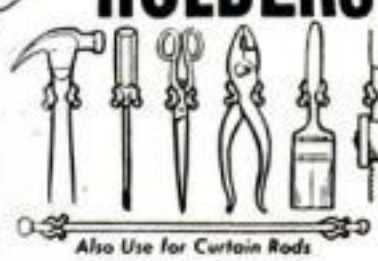
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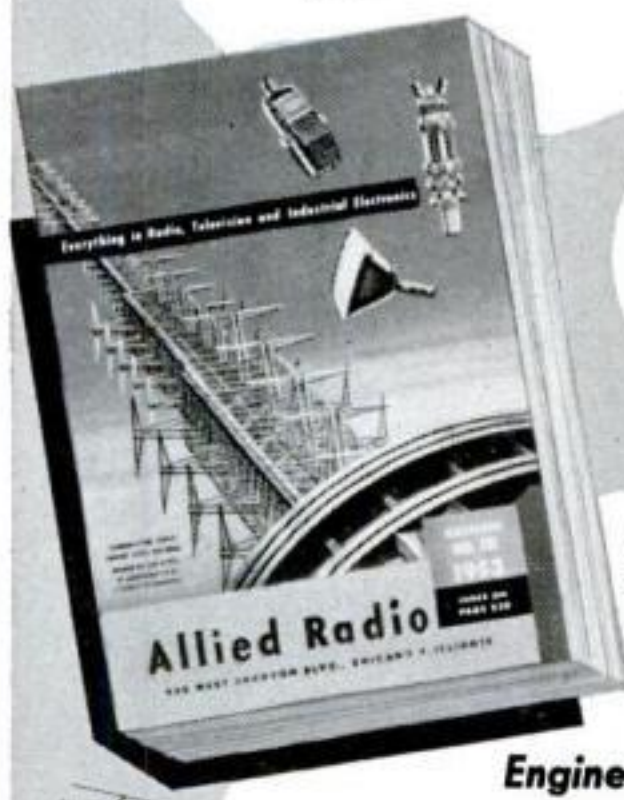
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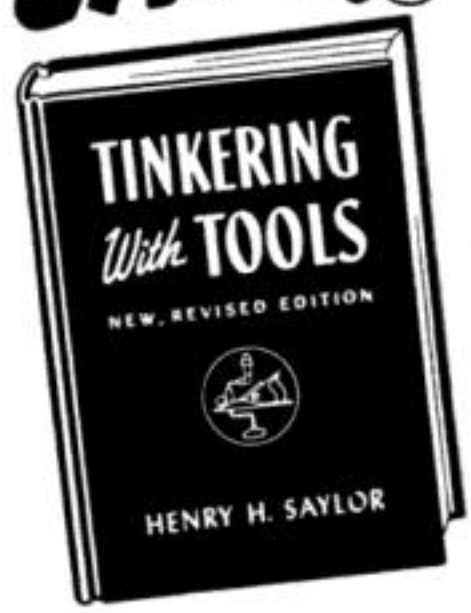
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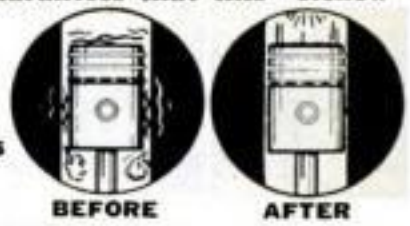
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**Complete with**

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- **1 (4" x 9") VENEER**

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Reg. $1.00 Set of 10 PROJECT PATTERNS that make it simple to make toys, household items . . . most anything, given as your FREE BONUS GIFT when amount *in full* accompanies order. (We pay postage.)

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Send 3 in 1 Saw and $1.00 FREE GIFT both POST PAID.

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## THE ZEPHYR Electric Drill



only $18.95

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**DRILL STANDS** *Add Many Uses for Zephyr Drill*



**Horizontal Drill Stand—** for Polishing, Buffing, Grinding, etc.

*Price* $1.00



**De Luxe Electric Work Saver Kit**



**Adjustable Vertical Drill Stand—** for drill press operations

*Price* $10.95

Includes above ZEPHYR Drill, plus 28 accessories for buffing, cleaning, drilling, grinding, mixing paint, polishing, sanding, sharpening, waxing, and wire brushing.

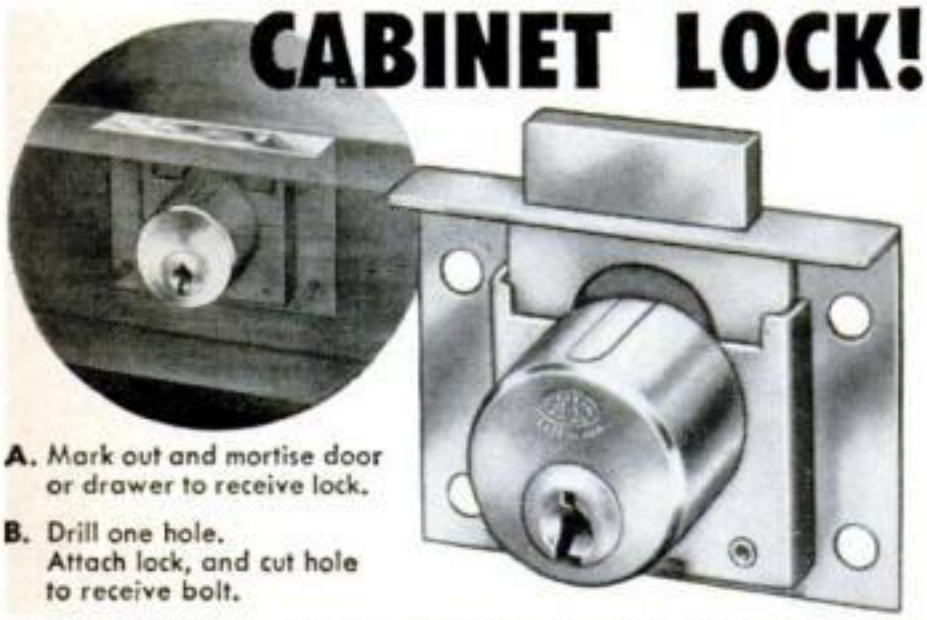
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"Paint-Dozer"



$9.95 complete

Strip paint to bare wood at rate of 6-10 feet per minute! Big 16 sq. in. heating area blisters paint . . . attached rear blade strips it off in *one continuous motion!* Ideal for house exteriors, boats, cabinets, all woodwork. Excellent painter's tool! Faster, neater than blowtorch! Operates on household electric current. Even beginners do fast, clean work with "Paint-Dozer". Has long-lasting ceramic 1,000° Hi-Temp heating element; heavy stamped-steel construction; Marinite insulation; pistol-grip hardwood handle. Complete with front and rear detachable blades and skids; groove and ridge cleaners; 8 ft. neoprene cord; safety stand; attachable front guide handle for horizontal work. *Fully guaranteed!* Order from your dealer, or write today for this professional tool. *Fast shipment.*

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**Complete with Wheel, Tire, Tube and Bearings**

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Size 26:00, 10 ply tire, smooth tread. uses tapered axle size 3 in. x 2¼ in. 10½ in. wide. Overall height 26 in. Static load 6,300 lbs.
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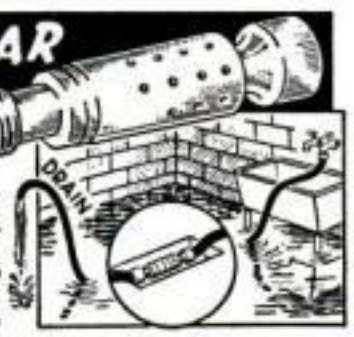
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**Capacity 300 GALLONS per Hour!**
No more hand-pumping or bailing of flooded basements when you have DRAINMASTER. Just connect to a handy faucet with garden hose, submerge in flood water, run another length of hose to open drain or out a window. DRAINMASTER does the rest. Solid brass, no moving parts to wear. Drains fish ponds, boat swimming pools, trenches, tanks, etc. ORDER TODAY! Be prepared for flood emergency..... **$3.95** *postpaid*

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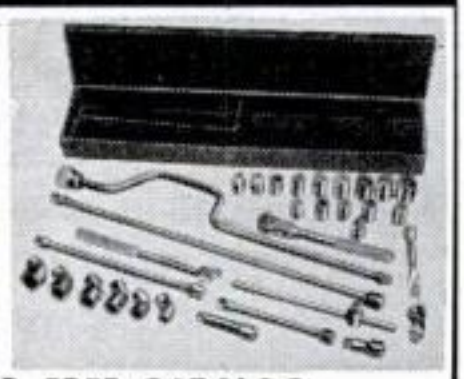
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**For Farm and Home Workshop**

Compressor has 2" bore, 1¾" stroke, 2.8 cfm up to 150 lb. pressure. Motor required: ¼ h.p. at 100 lbs.; ⅓ h.p. at 125 lbs.; ½ h.p. at 150 lbs. or equivalent gas engine. V-belt cast iron pulley, intake muffler and cleaner, bronze bearings, splash lubrication. Wt. 16 lbs. Price of compressor, as described **$20.50**




**COMPLETE OUTFIT.** Compressor, 6"x24" pressure tank, air gauge, air chuck, 20 ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank. 4-way cross and 3 nipples COMPLETE OUTFIT, wt. 30 lbs. **$32.45**

| Equipment less compressor | | Tank only |
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| with 6x24" tank **12.45** | 6x24" | **6.25** |
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### MODEL W200 COMPRESSOR
2½"x2". 2.55 to 4.80 c.f.m. up to 150 lb. pressure. Operates with ⅓-½-¾ HP motor. Reg. price $36.50. Special price..... **$27.95**
Wt. 24 lbs.

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Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13⅛"x11⅜"; inlet 8¾". Height 19". Width 18". Depth 16½". C.F.M. ¼" S.P. 1600; outlet vel. 1575. Wt. 45 lbs. **BLOWER LESS MOTOR AND DRIVE**..... **$27.50**
With belt and variable speed pulleys, $2.50 extra.

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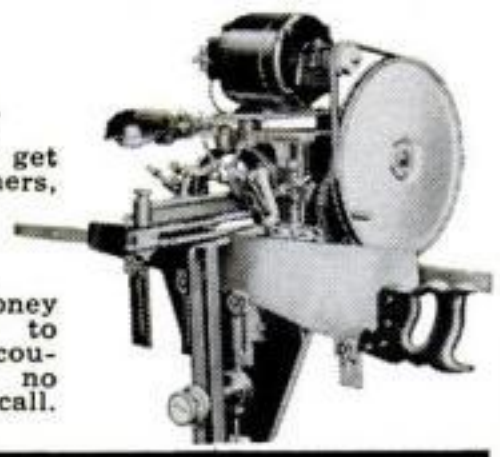
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½ HP 1750 or 3450 RPM 19.75
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Now your car can sound off those exciting, dynamic tones—easily controlled mechanically from your dashboard. Channel your exhaust through special pipes or muffler without removing your original muffler. Easily installed, MONEY BACK GUARANTEE

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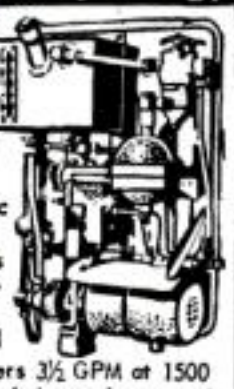


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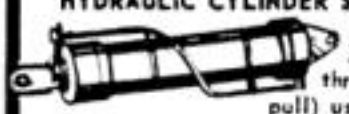
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Complete hydraulic pumping unit. All necessary parts assembled & ready to work at a great saving in time and cost to you. Delivers 3½ GPM at 1500 PSI at 1800 RPM. (other volumes and pressures can be attained by simple adaptations) Unit consists of a gear pump driven by a 2½HP, DC motor (4000 rpm max.), relief valve, pressure unloading switch, filter, accumulator, reservoir with sight gauge & complete plumbing. Mounted on 19"x 25" aluminum panel. Complete with 24V-DC motor. (Other motors of any current can be adapted) **49.95**

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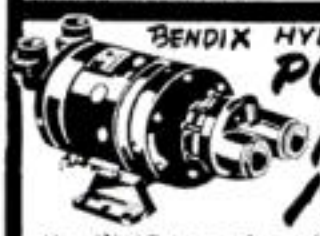
Gives 20,000 lb. thrust (push-pull) using 1500 PSI line pressure as obtained from our hyd pumps. Or will produce 40,000 lb. thrust with 3000 lb. line pressure. Can ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" bore, 1½" dia. piston shaft, 18" stroke, length: 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road, farm & shop machinery, presses etc. Cost gov't $390.00 . . . . . **29.95**



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We carry the World's largest supply of Special Hydraulic Equipment featuring over 20,000 cylinders in 61 sizes and types. Can also supply all accessories such as Pumps, Valves, Tanks, Hoses and Fittings Write for information.

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Has 3½ GPM capacity at 600 PSI. Motor is 1½ HP, 24V, DC. Operates on either 12 or 32V, DC current. Has built-in relief valve adj. to 1500 PSI. This unit ideal for bait tanks, hyd. lifts, portable loaders etc Cost govt. approximately $350.00.

### VICKERS HYDRAULIC VARIABLE DISPLACEMENT PUMP GENERATOR



May be used as an elec. motor driven type pressure generator in an hyd. system where a varying volume is desired with a non-pulsating flow. Will give max. volume at pressure settings between 600 & 900 PSI by simple adjustment screw. Pump housing serves as reservoir for system. Has built in compressed air supercharger to make system independent of outside atmospheric pressure. Rotation, left hand only. Max. speed for continuous duty 3750 RPM. Displacement .484 cu. in. per revolution or approx. 4 GPM at 1750 **32.50**

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AS SEEN IN AUGUST ISSUE OF POPULAR SCIENCE



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MOTOR 3.25



GEAR BOX NEW 12.95 USED 6.75

Here's a unit PACKED WITH BRUTE FORCE! Does all those hard, heavy jobs that ordinary power tools cannot handle. Easily made from a vacuum cleaner type motor, a gear reduction drive and a few homemade parts. Can be used for turning large nuts & bolts, digging post holes, drilling large holes in wood or metal, driving power tools & machinery, lifting, pulling, pushing, and any job where a slow speed with high torque is required. YOU CAN'T STALL IT! Lightweight, easy to handle. Has 1000's of uses in home, garage, shop, factory. We can supply all parts and supplies (except machine work).

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Converts a high speed, low power input into low speed, high power take-off. Has 2 take-off shafts at 4 to 1 & 16 to 1 ratio. Gear box has worm drive bronze gears & throw-out clutch. Will operate forward or reverse directions. Adaptable to many uses on power machinery **19.95**

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Has 1½ to 1 gear reduction through bevel gears. Pre-lubricated bearings in dust proof housing. – A Positive lever control clutch . Size. 7" x 6". – 3/4" take-off shaft . . . . . **3.95**

### HYDRAULIC HAND PUMP



Handle operated. Operating pressure 1000 PSI. Capacity 1.6 cu. inch per cycle. $55.00 Value – **10.75**

### WESTINGHOUSE AIR COMPRESSOR



1000's now in use for spraying, inflating, air tools, in garages, laboratories, shops & on trucks, tractors, jeeps, etc. Lightweight but powerful. Operates on ½HP, gas or electric motor Runs either direction. Delivers approx 3.27 CFM at 600 RPM or 6.54 CFM at 1200 Rpm. Has 2" bore, 1½" stroke.

We have motors, tanks & fittings to adapt this unit. **23.95**

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**GADGET MIX** – Rivets, Spacers, Bolts, Screws, Gears, Wheel Bearings, Springs and Clamps No. 106, 5 lbs. . . . **1.19**

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Designed for installation in water base fluids, as in coffee urns, sterilizers, humidifiers, etc. Has two copper-sheathed, tubular heat elements, silver soldered into head. A 3-heat type. 3000 watt. 230V., 2" pipe thread collar. . . . . **12.00**

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24v,DC energizing coil operates double pole, single throw switch. Holds circuit closed from a fraction to 15 sec. Adjustable for time desired. Adaptable to many uses . . . . . **2.25**

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Rust resistant, alloyed steel. Extra flexible. Pre-formed, 7 x 19 strand. On reels.

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| 3/32" – 5½¢ ft. (7x19) | | 9/32" – 15¢ ft. | |
| 1/8" – 7¢ ft. | " | 5/16" – 16½¢ ft. | |
| 5/32" – 7½¢ ft. | " | 3/8" – 18¢ ft. | |
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**SPECIAL** 3/16" cable, 18 feet long, with turnbuckle ends **.99¢**

**Stainless Steel Cable – Pre-Formed**

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|---|---|---|---|
| 1/16" . . . . | 7¢ ft. | 5/32" . . . . | 20¢ ft. |
| 1/8" . . . . | 18¢ ft | 3/16" . . . . | 23¢ ft. |

**Bronze Cable – Not Pre-Formed**

| | | | |
|---|---|---|---|
| 1/16" – | 5¢ ft. | 5/16" – | 23¢ ft. |
| 1/4" – | 17¢ ft | 1/2" – | 38¢ ft. |

## MAKE YOUR OWN ARC WELDER



R-1 **27.95**

Use this top quality, precision built R–1 generator An aircraft generator that originally cost the government approximately $400. Gives 300 to 400 amps at 27 volts. Ideal to convert for all welding, light or heavy up to 5/8" thickness. Free conversion instructions with each unit.

**OTHER AIRCRAFT GENERATORS**

| | | |
|---|---|---|
| X-10 | 12 to 15 Volts 50 Amps | $12.95 |
| X-11 | 27 VOLTS . . 200 AMPS | $15.95 |
| X-12 | 27 VOLTS. 100 AMPS | $25.00 NEW |
| X-13 | . . . 27 VOLT. 140 AMP. . | 16.95 |
| X-14 | .. 27 VOLT.. 75 AMP.. | 15.95 |

Also available - complete DC Arc Welder. 300 amps continuous. 350-400 amps intermittent. Write today for details.

### 230 PAGE CATALOG

1000's of ITEMS! Fully ILLUSTRATED! For the MECHANIC, SPORTSMAN, HOBBYIST, HOME OWNER, etc.

War Surplus — Factory Closeouts and General Merchandise Values! Save on Hardware, Hand & Power Tools, Gadgets, Sports Equipment, Hydraulics, etc. **SEND 50c for HANDLING & MAILING.**



### ELECT. GYRO



50,000 RPM. Motor is integral part of balance wheel. Has double end shaft to drive precision tools or machinery at precise, controlled speeds. Ball bearing mounted. High or low voltage. Ideal for experimental work, labs, hobbyists, technicians, etc. **4.95**

## ELECTRIC MOTORS

**606 – DELCO MOTOR**



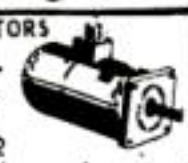
1/50 HP, 24v DC, 1.6 amp. turns 3000 RPM. Has adj. overspeed contactor to stabilize and control speed. Length 5½" Diam. 3". **ONLY 4.95**

**SAMSELL MOTOR**



27 volts, 16 amps, 1/5 H.P reversible, series wound on motor 3800 RPM, shaft 9/32" diameter 12-spline 4-1/8" x 2-3/8" **NEW** ONLY **3.95**

**SURPLUS MOTORS**



No. 500 – Used 1/2 HP - 27 volt, DC–AC. This motor can be readily adapted to deliver up to 1/2 HP on 110 volts AC by the simple method of rearranging armature brush-leads. Free Diagram with each order. A SENSATIONAL VALUE. **5.95**

### GEAR HEAD MOTOR



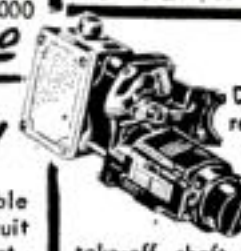
MOTOR ALONE 4.95
GEAR BOX 7.95

Heavy duty, G. E. GEAR HEAD motor. 2 HP, 24V, DC, 125 amp., reversible motor drives a reduction gear unit giving 36 to 1 ratio at take-off.

Also will operate on 6 or 12 volts.

| | | |
|---|---|---|
| 36 to 1 G.E. | (30 shaft RPM) | 10.95 EACH |
| 28 to 1 Eclipse | (130 shaft RPM) | |
| 40 to 1 Eclipse | (110 shaft RPM) | |

### LEAR GEAR HEAD MOTOR



– Lear 24 volt DC, 7.6 amp, series wound reversible motor with overload clutch. Motor turns 11,000 RPM driving thru a 10 to 1 gear reduction box which turns the final take-off shaft 1100 RPM. Adjustable limit switches control limit of travel. Take-off shaft adapts to flex or rigid drive. **17.50**

### ELECTRIC ACTUATOR



Hundreds of uses for any mechanical device needing controlled 2 way action. Opens, closes, raises or lowers doors... windows..gates..valves

**CTU-2 Foote Linear Actuator.** 24 Volt, DC 8500 RPM, 1/6 HP - series wound motor 4-1/2" stroke in 13-1/2 seconds. Compression & tension loads up to 750 lbs. Adjustable micro switch for limits of travel Overall lgth. retracted 11 inches **7.95**

### EASTMAN ACTUATOR



Has a 1/8 HP, 24V, DC, 10,000 RPM motor & push–pull actuator Actuator has a 4" travel through a reduction gear box Has adjustable limit switches and forward and reversing reversing relays Overall length extended, 20", retracted 25½" **12.95**

### FIRE EXTINGUISHER



Kiddie Lux – $CO^2$ Type. Built to Gov't specifications. Heavy, shatter-proof case. Recent hydro static test. Reconditioned and fully charged. LIKE NEW! READY FOR INSTANT USE ! !

3½ lb. size with Swing Nozzle . . **17.95**
7½ lb. size with Horn . . . . . **23.75**
10 lb. size with new Squeeze Grip Handle & 3½ ft. flex hose with Horn **29.75**
15 lb. size with Wheel Control . . **37.95**
15 lb. size with Squeeze Grip Handle, 4 ft. flex hose, Plastic Horn . . **42.50**

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[Continued from page 94]

Some 2,500 others got off with warnings.

The radar apparatus that has been such a help to the Connecticut State Police is called an Electro-Matic Speed Meter. Behind its front panel are two antennas. One sends out a cone-shaped stream of radar waves in whatever direction it is pointed, much as a searchlight focuses light beams. Whenever a moving object gets in their way, some of the waves bounce back. They rebound at a different frequency than the one they started out with. This change in their frequency varies directly with the speed of the object that reflects them.

### *Evidence Is Recorded*

The reflected waves, caught by the second antenna, are compared with the ones being sent out to get the difference in frequency. This difference is amplified and translated into miles per hour on a large speedometer. (Similar equipment is used to measure the speed of high-altitude rockets and guided missiles.)

When the Connecticut State Police use radar for traffic *enforcement,* they need a recorder. It has a spring motor driving graph paper on which a pen, synchronized with the speedometer, records the speed of each oncoming car as it moves within range.

Connecticut's traffic-court judges willingly accept the visible, permanent evidence of the radar graph when backed up by a witnessing officer's testimony. So the officer with the radar speed meter sits facing the same direction as the meter. When the graph recorder fingers a speeder, he radios a teammate to stop it, and jots down the car's registration number opposite the telltale peak on the graph. Then he notes the time of day, weather condition and state of traffic—a neat combination of evidence for the judge.

### *Testifies for the Defense, Too*

Radar has also been used to defend law-abiding drivers in Connecticut. The State Police frequently receive complaints about speeding through residential areas.

Sgt. Albert Kimball, who has worked with the radar equipment since it was first acquired, usually is sent to the scene of such complaints. The unblinking, unbiased eye of radar then takes a long look at the situation.

"Almost invariably," Sergeant Kimball reports, "the speed meter proves that the average driver isn't going nearly as fast as he looks and sounds to be."

The meter, which is manufactured by Automatic Signal Division, Eastern Industries, Inc., East Norwalk, Conn., has helped police catch traffic violators in 31 states—and even in Bermuda, where the speed limit is a flat 25, and no fooling.

In Massachusetts, however, radar is being put to work at quite a different highway job—establishing more intelligent speed limits. State traffic engineers, under the direction of Armand L. Phaneuf, use radar to watch the flow of cars over dangerous sections of road. They work unobtrusively, for they feel that the average driver would instinctively slow down if he spotted odd-looking instruments checking his speed.

For the legal limit, the engineers pick the speed at which or below which 85 percent of the radar-observed drivers travel a stretch of highway. In this way, radar has now set the speed limits on 30 percent of Massachusetts roads.

### *Works for Insurance Company*

West of the Mississippi, radar is improving the safety record of 500,000 long-distance trucks insured by the Farmers Truck Insurance Group. That company keeps 16 traffic engineers busy observing, with radar speed meters, the road behavior of drivers handling policy holders' trucks.

The transmitter-receiver is usually mounted on the roof of the engineer's car. Instead of lurking beside a highway, he will often cruise along the roads until he sees the rear of a truck. He then approaches to within 75 or 100 feet of the truck, and settles down to constant speed—say, 35 miles an hour. The radar apparatus instantly records the difference between his speed and the truck's. He merely has to add the two figures to find the speed of the truck.

No dirty trick, this works out to the advantage of a large majority of drivers. In a recent year, favorable reports were turned in on 94 percent of them. Like most people, they keep within speed limits whether they are watched or not. END

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**It's Not Easy**

ONE expert maintains that the most difficult thing to make on a car is the payments.



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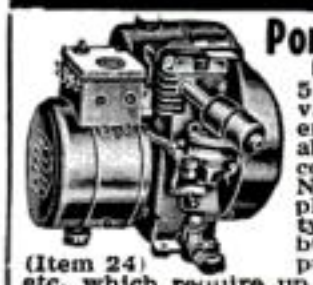
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## Portable LIGHT PLANT

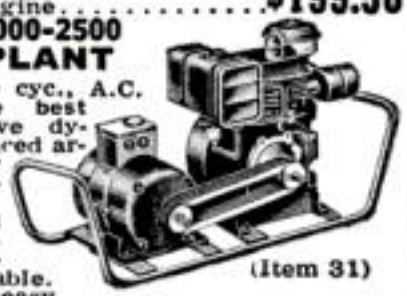
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(Item 24)

500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1¾ hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts: trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. **Be prepared if war or storm knocks out power lines.**
Reg. $275.00 value..... **$143.50**
**700-800 Watt Plant** (Item 44) **$169.95**
Same as above but greater output.
**1000-1200 Watt Plant** (Item 45) same as Item 24, but larger generator & engine..... **$199.50**

## GIANT 2000-2500 WATT PLANT



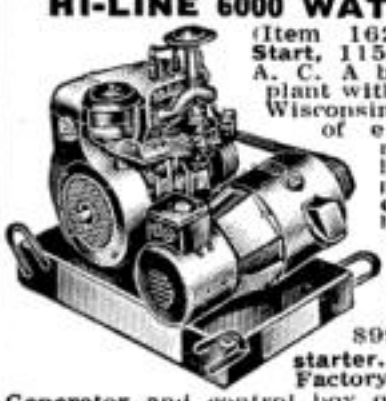
(Item 31)

110-120 V. 60 cyc., A.C. **Absolutely the best made** — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted — portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine —complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00. Special at... **$299.50**
**With Electric Self Starter** (Item 179) **$359.50**
**GENERATOR ONLY** and control box. Drive it with your engine or tractor.. **$169.50**

## 3000-3500 WATT PLANT

(Item 198) 110-220 v.—60 cyc. A.C. with Wis. Engine, **push button start.** Wt. 370 lbs. Heavy duty..... **$399.50**
**Generator only** for belt drive, Wt. 115 lbs. (Item 198A)..... **$239.50**

## HI-LINE 6000 WATT PLANT



(Item 162) **Push Button Start,** 115-230 v. 60 cycle A. C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. **With self starter.** Factory Spec. **$645.00**
Generator and control box only, belt driven. Use your engine or tractor. Wt. 240 lbs..... **$345.00**

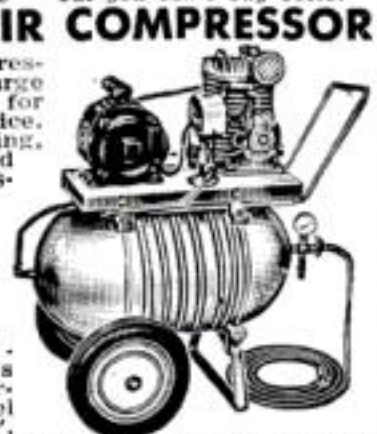
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## MASTER AIR COMPRESSOR



(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2"x2" compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12" x 24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Note low factory prices.
With ⅓ hp 110 v. A.C. motor (Reg. $175.00) (Item 209)..... **$98.50**
With ½ hp motor (Reg. $199.50) (Item 209A)..... **$119.50**
With 2 hp Briggs Gas Engine (Reg. $199.50) (Item 209B). **$109.50**
**Compressor** only (2"x1¾") (top quality) (Item 209C)..... **$20.50**
**Larger Compressor** (2"x2") (none better) (Item 209D)..... **$24.50**
**Giant Compressor** (twin 2½"x2") (Item 209E)..... **$54.50**
A complete line of spray guns and air tanks available at factory prices.

IMMEDIATE DELIVERY—ALL ITEMS

## HEAVY DUTY D-C ARC WELDER



(Item 38)

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. $400 value at.. **$99.75**
**DUAL CONTROL MODEL** same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec. **$119.50**
**WELDING KIT.** Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.... **$10.50**

## EXTENSION CORD




(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft. **$1.99**
Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **$4.95**
100 foot length (one piece)..... **$4.85**
**WIRE ONLY** (Item 50) No fittings, 100 ft. **$4.00**

## HEAVY DUTY POWER CABLE

#12—2 Cond.—stranded, very flexible, rubber covered, special outside conductor for grounding power tools, etc. Finest heavy duty power cable made. U.S. Surplus.
50 ft. (Wt. 8 lbs.) Item 199..... **$6.95**
100 ft. (Wt. 16 lbs.) Item 200..... **$12.95**

## 79 Pc. CARPENTER'S TOOL SET



Professional quality. A complete set of Master Mechanic tools featuring the famous **Stanley** brand. All neatly arranged in a beautiful sturdy 32" hvy. steel tool box. Set includes: Powerful ¼" Electric Drill (optional), 3 Stanley Wood Chisels, 29" Spring Steel Saw, Steel Bench Vise, Tin Shears, 9 Drill Bits, Sharpening Stone, 8" Plane, 24" Stanley Level, Hacksaw, Stanley Rule, 5 Double End Wrenches, 13 Asst'd. Hacksaw Blades, Stanley Hand Drill, 10" Vise Wrench, Comb. Square, Stanley Hammer, Stanley Ratchet Brace, Coping Saw, 7 Coping Saw Blades, Steel Wrecking Bar, 4 Screw Drivers, Offset Screw Driver, Nail Set, 4 Asst'd. Files, 8 Pc. Allen Wrench Set, Auger Bit Set and many other tools. Worth at least $150.00 if purchased separately. Save cost of tools on one or two jobs. A terrific value.
Wt. 41 lbs. Item 242 (without Electric Drill) ..... **$39.50**
Wt. 45 lbs. Item 242A (incl. Electric Drill)..... **$49.50**
Wt. 15 lbs. Item 243 (Tool Box only) ..... **$8.95**

## POTTER'S WHEEL

**Power Driven — Foot pedal speed control**



New compact modern design. Precision built to meet exacting requirements of professional artists — the finest wheel ever built. Mechanism fully enclosed for safety and to exclude moisture and clay. Foot-controlled variable speed drive provides instant, smooth speed range of 30 to 150 rpm. Equipped with adjustable arm rests. Easy to operate — even for handicapped persons. Reversible 10" throwing head — back side recessed for casting plaster bats. Larger **18x18"** throwing table; wedging wire attached; removable water cup inside. Heavy bronze bearings pre-lubricated, sturdily built for long, dependable service. Use ¼ hp motor (not incl.). Shipped fully assembled—just mount wheel and motor on table or sheet of ¾" plywood. Self storing—tip up on edge. Wt. 45 lbs. List price $125. Factory special. **$64.50**

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## MASTER SNOW BLOW SELF-PROPELLED

**It's a lawn mower — It's a plow**
**It's a power sickle — It's a bulldozer**
**It's a cultivator — It's a rotary tiller**



Tractor shown with Snow Blow Attachment

Item 206

Here at last is a power unit that does everything at a price that can't be matched. Built-in power takeoff to drive pumps, saws, generators, etc. Safety clutch—can't burn out. More versatile and efficient than tractors costing twice as much. Basic self propelled 2 hp tractor with Briggs or Clinton famous engine. Only.... **$119.50**

**Snow Blow** ..... **$29.50**
**Rotary Tiller** ..... **$42.50**
**Sickle Bar-Mower** ..... **$42.50**
**Bulldozer** ..... **$11.25**
**Lawn Mower Hitch**..... **$ 4.50**
**Cultivator** ..... **$ 8.75**
**Freight prepaid to most areas. Easy payment plan available.**

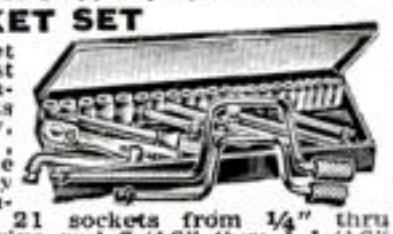


## COMMANDO BIKE MOTOR

(Item 90)

New, super-modern 1952 model. This job is the Cadillac of all bike motors. Sensational Auto-Clutch prevents killing motor at each stop. Also selects proper ratio on hills. Mounts behind and drives rear wheel with Dynarotor. Free Wheeling lever permits pedalling if desired. Rear Mounting eliminates fumes, heat, dirt, and hand steering. Easily installed in 15 minutes with home tools. Sturdy, trouble-free, easy starting, light weight. Airplane type engine: up to 150 miles per gallon. Fully guar. Ride for fun or profit. Ideal for deliveries, paper routes, messenger service, etc. Ride to work and save. **Dealer inquiries invited.**
The Commando Captain, 1 cylinder 1½ hp. ..... **$99.75**
The Commando General, 2 cylinder 3 hp. (Item 91)..... **$125.00**
All Commandos shipped prepaid in U.S.

## 32 pc. SOCKET SET



32-pc. Socket Set (Item 59) Highest quality guar. nonbreakable sockets made by Husky. Beautiful, matched chrome alloy, absolutely the best. Complete range of 21 sockets from ¼" thru 7/16" in ¼" drive and 7/16" thru 1-1/16" in ½" drive; 2 extensions, reversible ½" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, ¼" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. Easily worth $41.50. While they last. **$16.95**

## 45 pc. SOCKET SET

(Item 205) Contains a complete set of sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List Price $62.90. Factory Special.. **$26.95**

## ⅜" DRIVE 15 Pc. SOCKET SET

(Item 201) Same top qual. as above—includes 7 sockets ⅜" thru ¾", reversible ratchet, extension, flex. handle, cross bar, 3 punches, metal tool box. Wt. 5 lbs. List Price $18.96. Our Spec..... **$9.95**

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1½ ton (Item 208) Wt. 11 lbs..... **$6.45**
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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 v. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **$6.35; 9" Fan, wt. 6 lbs. $7.45;** 10" Fan, wt. 7 lb. **$8.45;** 12" Fan, wt. 8 lbs. **$9.45.**
**Heavy-duty 12" fan, enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, and other difficult applications. Wt. 12 lbs. Item 10D**..... **$12.95**

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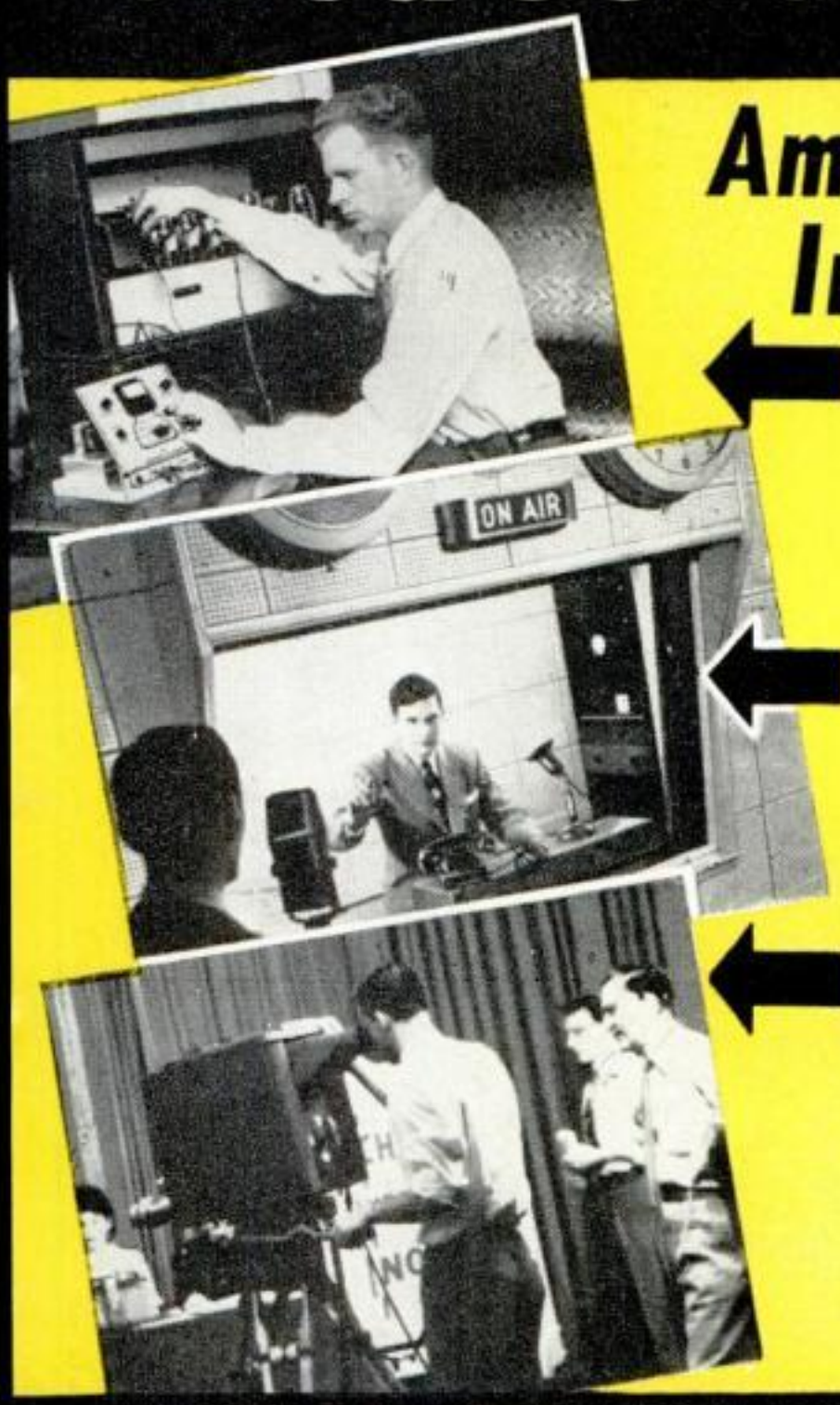
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Over 1800 additional Television stations have been authorized wi expecting to be operating in 1953. That will cause the sale and s of sets to boom in areas where there is no television now. All th opportunity, good pay, if you act to prepare **now.** Qualified Radio-T technicians are making u good money. Now the will increase; the field is

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Keep your job while tra home. Hundreds I've tra successful Radio-Televisi nicians. Most had no experience, many no mo grammar school educati cide now that you are know more and earn mor the important first ste career and security.

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**Smoke only Camels for 30 days...see for yourself how well**

# Camels agree with your throat!




● See for yourself why Camel is America's most popular cigarette—leading all other brands by billions.

Smoke only Camels for thirty days and see how Camel's rich flavor pleases *your* taste... see how Camel's cool mildness agrees with *your* throat, pack after pack! Prove to yourself in your own "T-Zone" how mild and flavorful Camels are!

**TEST CAMELS IN YOUR "T-ZONE" (T FOR THROAT, T FOR TASTE)**



R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

**CAMEL leads all other brands *by billions!***

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